The MINING CONGRESS JOURNAL

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Serving the Mining Industry Through the U. S. Bureau of Mines

Annual Meeting—The American Mining Congress

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Diamond Drill Practice at the Bunker-Hill and Sullivan Mining and Concentrating Company

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Churn Drilling Practice in the Tri-State Zinc-Lead District

Contributors:

Howard I. Young, Dr. John Wellington Finch, G. B. Southward, E. J. Newbaker, L. Ward Bannister, Mayer G. Hansen, U. E. Brown, S. O. Andros, W. F. Netzeband

JANUARY

1935

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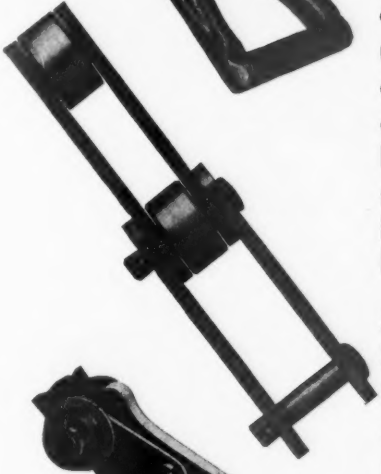

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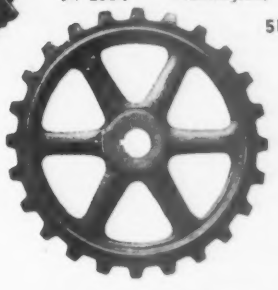

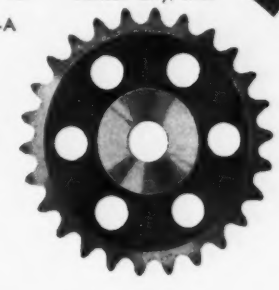

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E. R. Coombes
Editor

G. B. Southward
Associate Editor

Howard B. Driscoll
Advertising Manager

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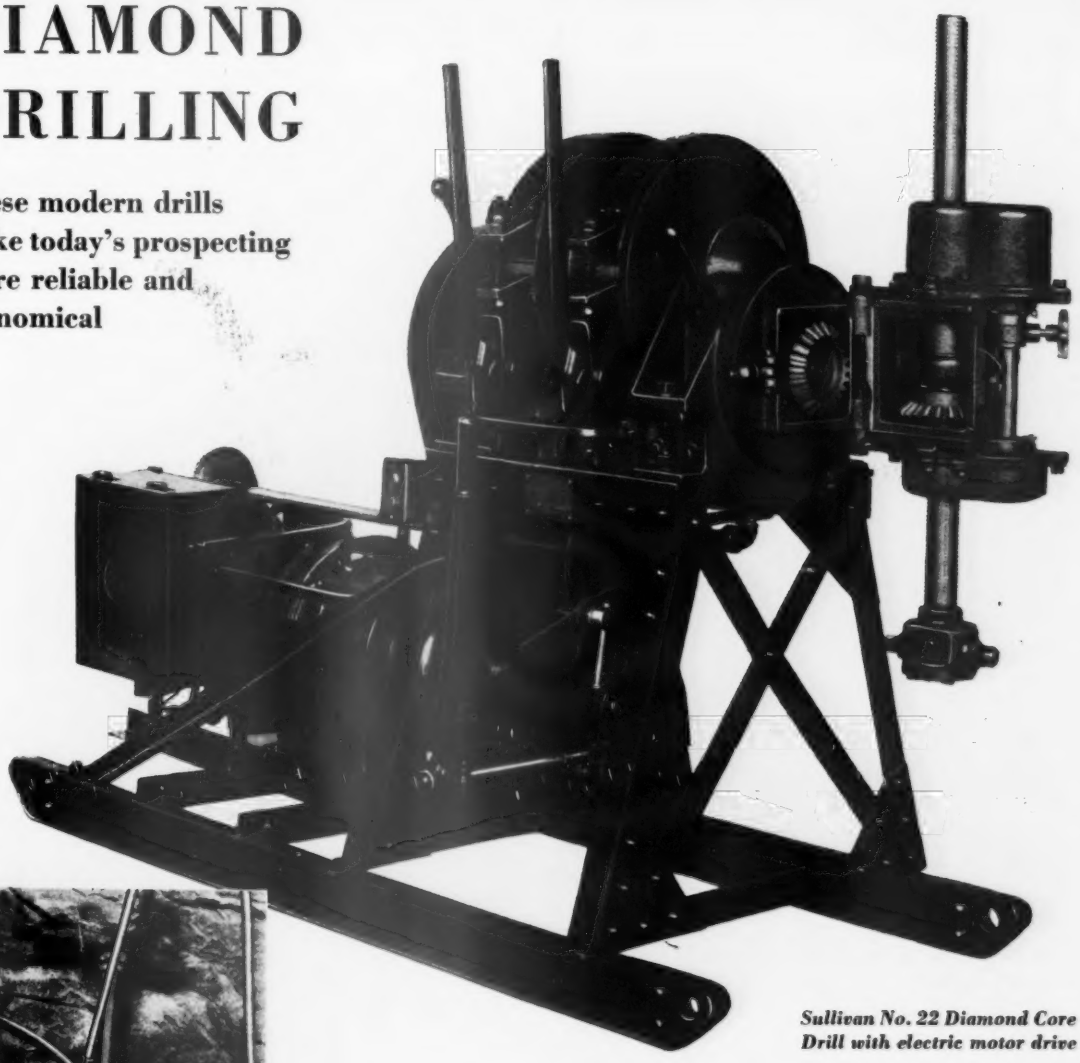

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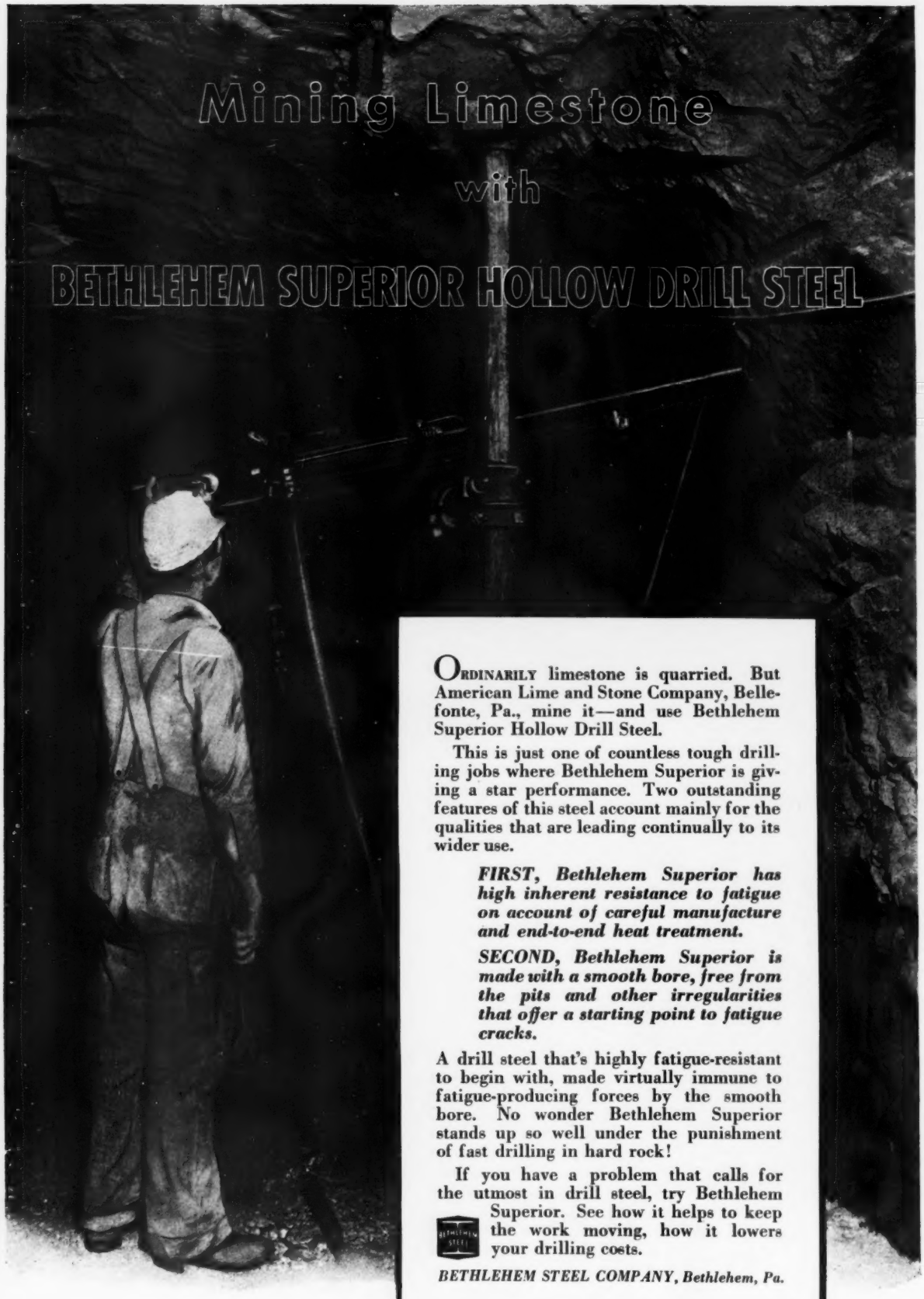

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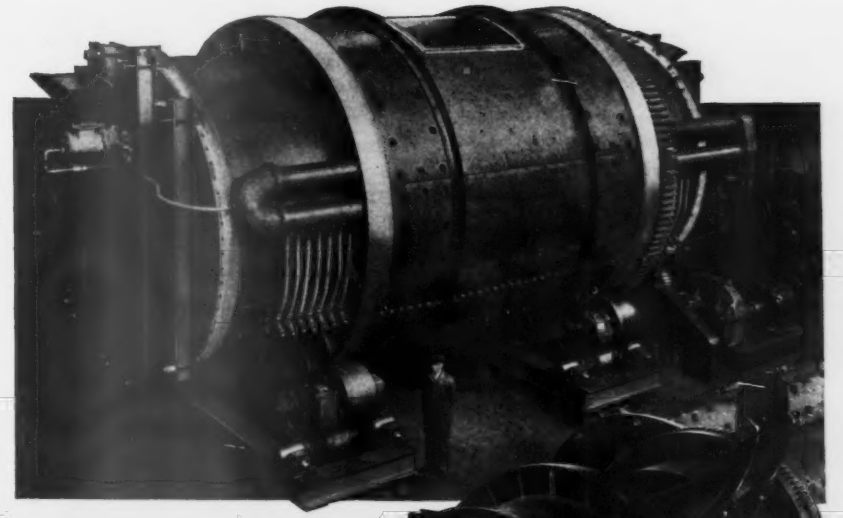
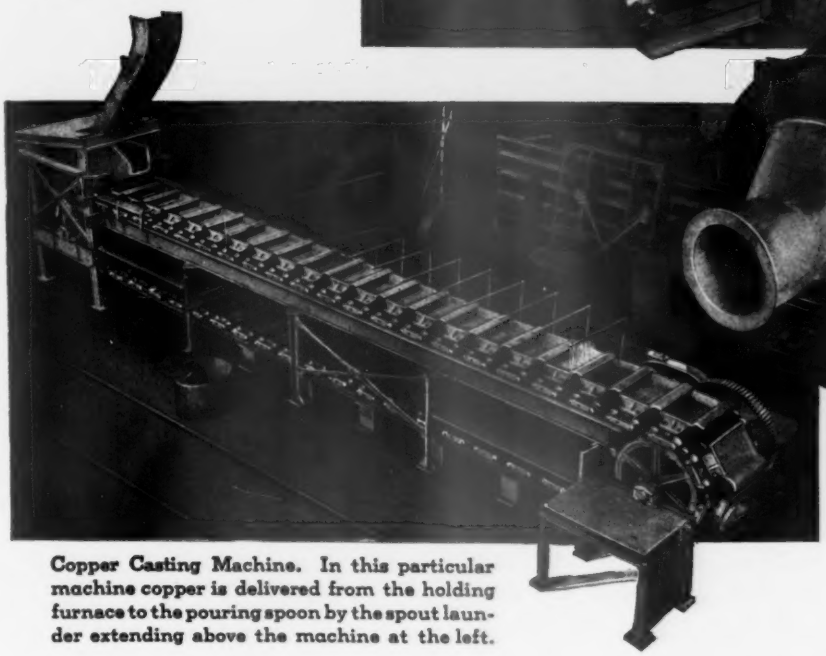
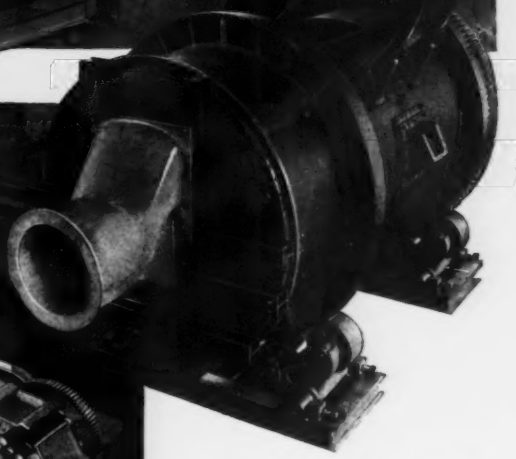
Casting Machines



One of three 13′ x 30′ Pierce-Smith Copper Converters for a South African Mine.



Copper Casting Machine. In this particular machine copper is delivered from the holding furnace to the pouring spoon by the spout launder extending above the machine at the left.



One of two Holding Furnaces for use with the Converters shown above.

PRESENT DAY metallurgical equipment has reached a high state of perfection and through over half a century Allis-Chalmers, with its predecessor companies, has unquestionably been one of the outstanding contributers to its development. Allis-Chalmers machinery is recognized as standard throughout the world. It is found in every mining district. No other organization is in a position to offer such a complete line of mechanical, and electrical, equipment . . . following through from the primary crushers to the casting machines.

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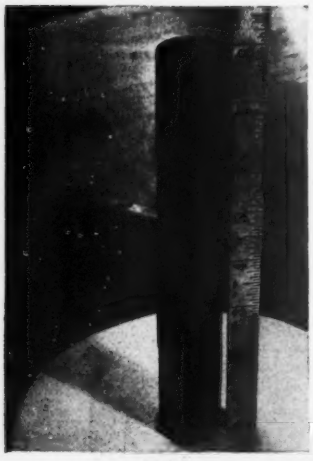

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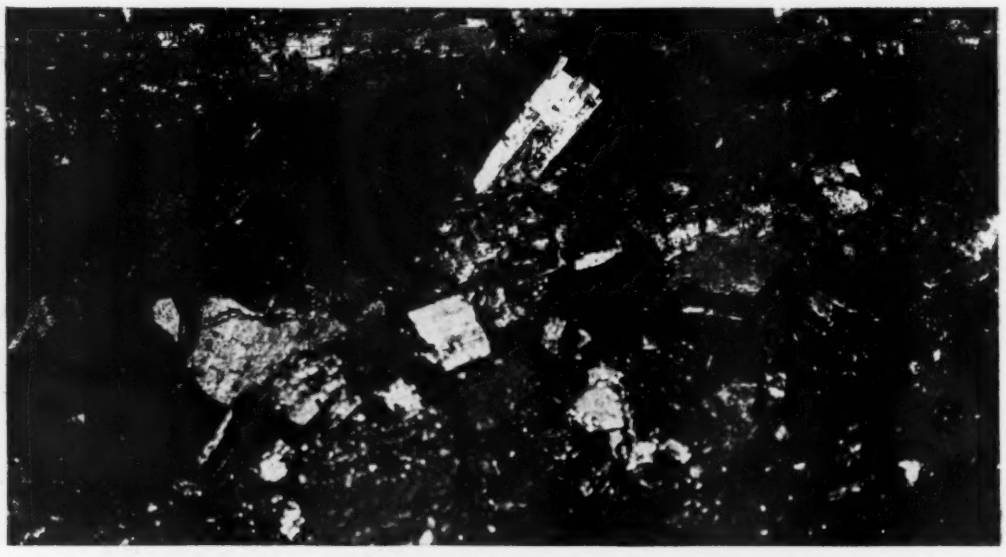

SHINING, BRIGHT COAL—the kind that sells—not dull or discolored—that's what Hercules Pellet "D" produces.

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"MINERS LIKE IT," says George K. Anderson, Hercules service man in West Virginia. "They won't take anything else because of good results and reduced fumes and smoke."

LUMP THAT STAYS LUMP. Firm chunks, clean and solid, that break less in handling, come from Hercules Pellet "D" because it doesn't grind or "go through" the coal.

M-10

INFLATION

INFLATION is in the air. Shivers run down the spines of all conservative students of that greatest of all economic problems, money.

The dangerous theory that Government credit is unlimited and that money can be issued, without limit, by the Government is being used to justify raids on the Treasury for the benefit of those unpatriotic minorities which harbor the selfish desire to profit at the expense of others.

If the greatest economic students of the world admit their inability to understand the basic principles of money, it can hardly be expected that those Senators and Representatives who have heretofore been absorbed mainly in politics or business should realize the grave dangers of either too much or too little.

Too much blood or too little blood in the human body means illness and perhaps death. Too much money or too little money, in the channels of commerce, means hardship to debtors or to creditors and in the end either unbearable burdens upon the wage earners or business panic.

What is money? A medium of exchange; a measure of value; a store of accumulated wealth; a legal tender for the payment of debts. Gold is not money, silver is not money, paper is not money until and only when it bears the stamp of government and is declared by law to be legal tender for the payment of debts.

When any government undertakes to meet the demand of selfish interests for relief, insisting that such relief shall be provided by the creation of debt, either by the issuance of bonds or the printing of fiat money, it is on the road to bankruptcy which is but a later stage of inflation.

At this time plans are under consideration to induce Congress to provide enormous appropriations for various kinds of unusual relief. Proponents are insisting that government, unable to pay from current receipts, shall print enough paper money to meet these new demands at a time when the credit of the nation is being strained by the necessary cost of relief for the unemployed. Those who point to the wealth of the United States of three hundred eighty billion dollars in 1929, and two hundred forty billion dollars in 1933, insist that a debt of fifty billion dollars may well be carried by so wealthy a nation. These may well be asked the cause of the reduction of one hundred forty billion dollars in the national wealth from 1929 to 1933—the intrinsic value of its property being more in 1933 than in 1929—and also what a similar reduction from the 1933 level would mean as related to our present indebtedness, to say nothing of the proposed increases.

In discussing inflation we may well consider the experience of other countries. France's inflation led to a money with a value of twenty per cent. After Germany's inflation a billion German marks were only worth the former gold value of one mark.

The ability to pay debts is determined by the amounts earned above costs of operation including taxes. Two-fifths of the earnings of the American people are now absorbed in the costs of government. From the remaining three-fifths must come wages and a fair return on capital investment. Business depression results from the inability to earn a profit under these conditions.

If government costs are to be largely increased the burden cannot be met from the earnings of a capital fund reduced from three hundred eighty billion dollars in 1929 to two hundred forty billion dollars in 1933 and still further reduced in 1934. This burden must be largely assumed by labor either in a decrease of wages or in increased living costs which force present wages to a lower purchasing power.

Are we ready to face a living cost level which is bound to follow in the steps of inflation? It has been proposed that we reflate to the price level of 1926. This proposal is intelligent, fair to debtors, and will provide business with a circulating medium fully ample for its requirements. Every price increase above that point will work a similar hardship on creditors.

Except as to debts and foreign trade, wages and price levels are of no consequence. Wages and commodity price levels quickly adjust themselves. If we do not need foreign trade, we can pay wages which make costs excessive. If we must have foreign trade, costs must be kept at a level proportionate to foreign price levels. Ninety per cent of prices are wages and whether high or low, wages must represent the greater part, but a little less than the earnings of industry.

If the New Deal increases wages and at the same time brings about, in greater ratio, an increase in price levels it will work a lasting injury to the wage earner. Wages and prices must rise and fall together. Inflation, either of our currency or our credit, must be guarded against with the holy zeal of the crusader by every lover of liberty and fair dealing.

The
MINING CONGRESS JOURNAL

VOLUME 21
NUMBER 1

JANUARY
1935

A Journal for the entire mining industry published by The American Mining Congress

All Those Recovery Programs

THE war between the industrialists, theorists and politicians still endures. With the close of 1934, predictions and proposals are many and varied as to what 1935 has in store. Of one thing we may all be certain: major attempts to correct our ailments by legislation will be made. Industry, represented by industrial leaders giving a fair cross section, are plain spoken and positive that any further tinkering with the economic system will be disastrous. They have asked to be permitted to guide themselves out of the disasters that have overtaken us. Their patience seems to have been at the breaking point, with but little that could be done about it. Labor leaders are insisting that they are the Moses of this generation; that their plan, including the 30-hour work week and social and economic insurance of various kinds, offers the only road to prosperity. Politicians have their bag quite full of tricks and are anxious to demonstrate their ideas, and to prove them right—by law.

The past five years have been exceedingly trying years for the mining industry. Nineteen-thirty-four gave promise of surcease from strife that failed to materialize. Nineteen-thirty-five offers even greater promise and with more possibility of fulfillment. If too many straw-grabbers do not upset the boat, industry will gather strength and finish 1935 at the top.

1935

As the dark clouds of the depression recede and the sun shows a tiny ray through the murky atmosphere, we extend to our friends an earnest "Happy New Year," with confidence in its fulfillment. The Mineral Industries, representing the second largest national asset, have been sorely tried by adversity. They have staunchly combatted conditions. With 1935 comes the real hope of a prosperous nation—prosperous industry—prosperous people. Certainly mining may be counted upon to give every aid to bring about that happy condition. And so we wish for our readers—our friends—our advertisers . . . and that great family of 25,000,000 people dependent upon the mineral industry . . .

A Happy and a Prosperous New Year.

The Future Of NIRA

WE HAVE six more months of the National Industrial Recovery Law. It must then be either abandoned or new legislation proposed to perpetuate it. What is the attitude of mining men toward this legislation? Most of the mining group is operating under code. Many are happy with their codes; many are decidedly unhappy; still others are uncodified and glad or sorry as the case may be. Certainly there is wide difference of opinion in mining circles as to the benefits of the NIRA. The President of The American Mining Congress, speaking at its annual meeting and in behalf of a very large percentage of all branches of mining, may be assumed as speaking with authority for that group, and to give their views on this important question. Mr. Young said:

"Until business is on a more normal basis it will no doubt be necessary that we have some plan by which there will be flexible regulation of minimum wages and maximum hours, and a provision by which producers of natural resources products can cooperate in controlling production and conserving the natural resources of the country. The good features of the present law should be retained, and the objectionable features modified or eliminated. We realize that only by experience shall we be able to determine what is good and what is bad. We should, therefore, give our whole-hearted cooperation to those Government agencies that are, in good faith, seeking that end."

Too Much Haste

EVERY indication is that the Seventy-fourth Congress will seriously consider, and most probably enact, legislation for unemployment insurance. The Administration has declared itself in favor of it; labor organizations generally have actively advanced the idea; and industry seems to be more or less apathetic. At any rate, there is no definite opposition to the proposal, except desultory opposition from unrelated quarters which will have little weight against the tremendous organized proponents.

This type of legislation is new to this country, although it has been in force in European countries for some time, where the results have been anything but satisfactory. It is authoritatively stated that their costs are 15 percent of pay roll, and that we may expect the same result if we shall adopt the same ideas. In this country, Wisconsin is the only state having this type of insurance. Its plan became compulsory in July, 1934—a period entirely too short to demonstrate its feasibility or unfeasibility. Old age pensions, a companion proposal to unemployment insurance, will shortly be effective in 20 states and two territories. It is at once obvious that our experience with this type of legislation is exceedingly meager.

The whole idea is that of compulsory saving, whether it is from funds paid by government, industry, the worker, a bi-party or a tri-party plan. Whatever the plan, the result is the same, because the money comes out of wages in one form or another—increased cost of articles—increased taxation.

We should make haste slowly. We should investigate what has been done at home and abroad; we should learn what the results have been, and when legislation is finally enacted it should be wise and sound, based upon fact-

founded data, and sponsored by industry as well as by labor and political expediency.

The Best Interests of All

THE mineral industries are unquestionably against Government in competition with business. Natural resource industries believe that there should be a cooperative and constructive effort made toward recovery through the best efforts of Government *and* business. Conservation of natural resources, capacity to produce in time of need, the greatly enlarged ability to re-employ labor, and the moving of the wheels of industry are of paramount importance. But direct and arbitrary bureaucratic control should not enter into the picture. It is becoming increasingly apparent that there will be a definite effort to place natural resources—particularly power and minerals—under Government "supervision." The report of the President's Natural Resource Committee, which has been studying and has recently released its recommendations, is indicative of what may be anticipated. We shall await with interest the President's message to Congress, with its recommendations for legislation in behalf of minerals.

It is necessary that the mineral industries have a common meeting ground—an open forum where the views of all may be consolidated and where concerted definite action may be advanced for the good of this great "industry" which represents a capital investment of approximately $15,000,000,000; which directly or indirectly employs 1,700,000 people; which furnished 55.9 percent of the revenue freight of the railroads; and which in normal times pays $2,000,000,000 in wages, and $200,000,000 in taxes. The American Mining Congress *is* that open forum. Its services are available to each and every branch of the mineral industry. It is the common denominator, the clearing house for mining problems. Give it your whole-hearted support. The investment is probably the best you will be able to make in 1935.

Resolutions

THIS IS the time of year when we "turn over new leaves"; when we promise to be better boys; when we agree to "do unto others" and recognize similar, kindred, hopeful, upward-looking ideals. The annual meeting of The American Mining Congress, speaking for the great mineral producing industries, adopted many resolutions, designed to give a promise of performance, and a hopeful pledge for 1935. These included the following:

(1) Pledged their earnest effort to help reestablish sound economic conditions in the interest of the general welfare not only of owners and employes, but all others, to the end that the standard of living may be maintained upward, and that the greatest utilization of our mineral resources may be accomplished; (2) A willingness and intention to cooperate wholeheartedly with the government in advancing and expediting national recovery; (3) Urged self-government for the mineral industry, and pledged constructive action under a reasonable relaxation of the anti-trust laws which will permit legal and free plans looking toward stabilization.

As their platform for 1935 the mining industry endorsed heartily the proposals adopted by the Western Division, representing some 80% of metals production, as follows:

"The mining industry is dependent upon a general recovery of all industry, its products go largely into the manufacture of those goods needed for plant extensions, heavy machinery, building operations and replacement of transportation equipment.

"The labor policy of the Government, beginning with the enactment of Section 7(a), has not only added to the cost of production of metals and fuels, but likewise to the cost of production of machinery and supplies and has created a feeling of uncertainty which militates against future commitments and undertakings.

"We believe that labor is entitled to the highest wages that industry can pay. The amount which can be paid to labor is measured by the income less necessary deduction for maintenance and extension of production facilities, for the payment of taxes, for the finding and development of ore to replace that which is used up in the course of operations and for a return on the capital invested in amount necessary to retain it in the industry and attract new capital when needed. Wages are paid from income and income is not created by law but only through production of goods.

"Inasmuch as eight hours is an entirely reasonable daily work period and inasmuch as the work or shift cycle in practically all mines and in most other lines of industry has been built up and adjusted to such work day, and as any reduction in the number of daily work hours will work untold hardship upon the mining industries as well as upon those who labor in mines, we strongly urge that there be no attempt to shorten the working day by law. We oppose specifically any legislative proposal to shorten the working day and to restrict working time to 30 hours per week.

"The mineral industry is in thorough sympathy with legislation and administration designed to curb practices which contributed toward the collapse of our credit structure.

"We urge stabilization of monetary policies and definite assurance that taxation shall be used only as a means of securing necessary revenue and not as a means of redistributing wealth.

"We believe that the great increases in Federal income and estate taxes, together with income and estate taxes now imposed by practically all the states, constitute a total tax upon profits and savings which is unjust and confiscatory, and that such tax is forcing capital, which should go into new undertakings and capital investments, into Government bonds and other liquid securities in order that upon the death of their owners, estates may quickly meet the demands of Government for a major share of the value of estates in cash.

"We urge that the Government shall retire from business in competition with its citizens and that it shall refrain from interference in the conduct of business except insofar as may be necessary to protect the rights of all citizens.

"We believe that labor should be given the right to representation in collective bargaining by those of its own selection; that the plan of proportionate representation of labor in any industry should be recognized and that the right of the individual, not a member of a labor organization, to conduct bargaining by means of his own choice, shall not be restricted or abridged.

"We endorse the principle that every organization of employers and employes shall be made equally subject to public authority, legally answerable for its own conduct or that of its agents, and equally subject to judicial remedy."

Some Problems of the Mineral Industries

By HOWARD I. YOUNG*

IT HAS been several years since normal conditions have been enjoyed by any of the mining activities represented in this meeting, and it is, therefore, well for us to spend a few minutes in reviewing the magnitude of the industry we represent. When we consider all the units: bituminous and anthracite coal, iron, copper, lead, zinc, gold, silver, petroleum and natural gas, crushed stone and gravel, gypsum, slag, sulphur, quick silver, and the clays, there is a total capital investment represented of approximately $12,000,000,000. In the normal five-year period, 1924 to 1928, these industries produced an average annual value of $4,500,000,000. There were employed in mining operations approximately 800,000 and the mining industry afforded employment to over 1,700,000 people with an annual payroll of $2,200,000,000. The activities of these various industries were conducted in 65 percent of the counties in the United States. The payment of Federal taxes alone was in excess of $150,000,000 annually. Today only the producers of precious metals have a demand for their production, so that these properties are being operated at capacity. The other industries represented here are operating from a low of 15 percent of their capacity to a high of 60 percent of their capacity. These industries are cooperating with the Government in its recovery program, but until recently, the Recovery Program had not improved our condition. With the present Housing Program steadily gaining, there is reason to be hopeful of increased demand for our products during the coming year.

The consumption of materials in the durable goods industry has lagged far behind the consumption of consumers' goods. It has been conservatively estimated that the pent-up needs of the durable goods industry aggregate in excess of $40,000,000,000. Until confidence has been sufficiently restored so that new construction and heavy industries are consuming our products, we cannot reasonably expect much improvement above the consuming levels that we have experienced during the current year.

A careful survey of the construction and heavy and durable goods industries shows that of the present number of unemployed, estimated at approximately 10,000,000, 5,000,000 could be absorbed by these and allied industries.

There has recently been a marked improvement in the general business sentiment in all lines, and with the announcement by the Government of a constructive program of cooperation with business enterprises, it would be reasonable to expect increased activities in all mining industries.

Legislation Pending

30-*Hour Week*

Certain legislation, which is being sponsored by powerful groups, will be presented to the coming session of Congress. The most dangerous legislation discussed in the past sessions, and which is likely to come up before the coming session, is no doubt the 30-hour week bill. No part of our industry can absorb the increased cost such a law would produce. The purchasing power of the country would be reduced, and instead of increasing our volume of business, the effect of this measure would be just the opposite. Industry as a whole has endeavored to spread employment to the fullest extent. I believe that one of our troubles today is that the total wage being paid by industry is being spread so thinly that very few of the people receiving wages have much more than enough to meet current living expenses. We know that to have general prosperity the wage earner must have in his pay envelope sufficient compensation to cover more than his usual living cost, otherwise, the contents of his pay envelope go to only those industries classified as "consumers" goods and do not help the mining, or "durable goods" industry. A 30-hour week would further increase the cost of living, and the purchasing power of the individual workman would not be increased. Very few, if any, industries today could absorb the increased cost that would be brought about by such a measure, and the enactment of this law would no doubt force many plants now being operated to discontinue operations, thereby creating additional unemployment.

We should clearly set forth our position regarding this measure, and join with other industrial groups in opposing this, or any similar legislation that will retard recovery.

Reenactment of NIRA

The present NIRA law expires next June. Most of the mining divisions are operating under a code. There is a wide difference of opinion as to the value of the codes in the various industries. Until business is on a more normal basis, it will no doubt be necessary that we have some plan by which there will be flexible regulation of minimum wages and maximum hours, and a provision by which producers of natural resource products can cooperate in controlling production and conserving the natural resources of the country. The good features of the present law should be retained, and the objectionable features modified or eliminated. We should realize that only by experience shall we be able to determine what is good and what is bad. We should, therefore, give our whole-hearted cooperation to those Government agencies that are, in good faith, seeking that end.

Old Age Pensions

Social legislation, namely old age pensions and unemployment insurance, will no doubt have an important place in the program of the Seventy-fourth Congress.

Old age pensions will be effective within the next six months in 20 states and 2 territories. Fifteen of the states make the pensions effective at the age of 65, one at 68, and 14 at 70. Payments are made on a weekly, monthly, or annual basis, and the local administration, in most cases, is by county boards under state supervision. The required residence in a state to be eligible varies from a minimum of five years in Delaware, to a maximum of 35 years in Arizona. In nine states the cost is supported by the state and county. In seven states the state bears the entire cost, and in 14 the entire cost is provided by the county. Pension payments vary from a minimum of $15 per month to a maximum of $35 per month in 26 of the states and territories. The states of Massachusetts and New York have no maximum payment limit, each case being analyzed and provided for on basis set by the administrative board. The cost

* President, American Zinc, Lead & Smelting Co.; President, The American Mining Congress. Address before the members of the American Mining Congress at Washington, D. C., on December 13, 1934.

per capita per year in these states varies from a minimum of 6 cents in Maryland to a maximum of $1.27 in Massachusetts. Demand for this form of insurance has increased in the last four years, and will no doubt become law in all the states within a reasonable length of time.

Unemployment Insurance

This type of insurance is new to this country, and should be carefully investigated. The only state having this type of insurance is Wisconsin, where the plan became compulsory in July of this year. The Wisconsin law provides that the employer shall set aside 2 percent of the wages of each employe until there is a reserve in the account of each employe of $55. After $55 has been set aside for each employe, the rate shall be reduced to 1 percent, which shall apply until a total of $75 for each employe is in the reserve, after which no further contributions are to be made. The employe does not participate in the reserve during the first two weeks of unemployment. Thereafter the benefit is 50 percent of the weekly wage with a minimum of $5 and a maximum of $10 per week. Provisions are made covering part-time employment so that the employe may draw on the reserve when his part-time pay is less than the payment he would receive in case of unemployment. Unemployment insurance in European countries has, in times of depression, proved inadequate to provide the protection expected.

Careful analyses and studies of old age and unemployment insurance proposals should be made before having the indorsement of the industries we represent.

Taxation

The steadily mounting Government expenditures for necessary relief and other purposes will no doubt cause Congress to attempt to make further increases in taxes. A recent reliable Washington service estimates that at present the Government's monthly payroll is a total of $276,000,000, of which $120,000,000 is ordinary Government expense, $145,000,000 relief, and $11,000,000 CCC camps. The relief requirements are steadily increasing, and with a continuation of these large payments for Federal payroll, it is only reasonable to expect that our Federal tax problems will become more burdensome.

The mineral industries normally pay in excess of $150,000,000 annually in Federal taxes. With the increases in state and county taxes, our industries cannot stand additional Federal taxes. Your Tax Committee carefully analyzes the various measures that are proposed from time to time, and you should be prepared to give them such data and cooperation that is necessary to protest effectively any new tax measure.

Purpose and Aim of American Mining Congress

The various branches of mining represented here have problems within their own individual industries, which are handled through the organization they have created for that purpose. I have undertaken to outline briefly here some of the major problems facing us that are common to all branches of the mining industry. In order to handle successfully and satisfactorily these problems we must first have a frank expression from the representatives, setting forth their views on legislation, with the hope that all branches in mining will agree on a policy that is beneficial to all the members of the Mining Congress. The Mining Congress is not a trade association. It occupies a position in the industry incomparable with any other organization. Its function is the correlation and coordination of the views of every branch of the mining interests upon those problems in which there is a mutual interest. We need the wholehearted cooperation and constructive suggestion of every unit represented, without which the officers and directors of the Mining Congress cannot properly serve your best interests.

It is hoped that we shall develop through these meetings a constructive program of cooperation within the industry that can be carried on in cooperating with other industries and the National Administration in its Recovery Program.

There is no more important matter before the mining industry today than to lend its best efforts with others to arrive at some constructive program of cooperation between business and the Government.

Serving the Mining Industry Through the U. S. Bureau of Mines†

By DR. JOHN WELLINGTON FINCH*

THE MINING CONGRESS JOURNAL printed a little paragraph a short time ago saying Professor Finch had been chosen as Director of the Bureau of Mines. My role as Professor has been a fairly short one, only eight years out of some thirty-five years of experience, and the balance of that time I have been a mining man. I rather prefer to have you think of me as a mining man because the professorial profession is pretty well represented in Washington. And, I might say with equal emphasis that the mining fraternity is not. The point of bringing that up is to assure you that I am still a mining man; that I have your point of view. I might say further that I am still studying the Bureau from that point of view, the same point of view I had when I was using its service, the same as you have, so this will be an objective discussion of the Bureau so far as I am concerned. I have not entirely gotten into the inside as yet, but I may mention a few things that have been conspicuous to me in the short time I have been with it.

We all know, of course, that the Bureau of Mines is intended to be, and has been, a service organization. It is the principal service organization for mining people in Washington. The U. S. Geological Survey, although it has a wider field and does a greater variety of things for a greater variety of people, also serves the mining industry. Some of the doleful things I shall tell you about the condition of the Bureau of Mines will apply to the U. S. Geological Survey. During this period of stress and strain all those things connected with mining have vanished more or less into the background.

Referring to the service functions of the Bureau of Mines, I want to point out to you, as you probably already know, that the Bureau has no regulatory functions and no administrative functions. It is not a bureaucratic organization directing the mining people what to do and so long as I am at the head of it I want to assure you that it will not have that character.

I shall now proceed to tell you some of the things with which we have to contend.

I want the Bureau to continue to be a service that is friendly and cooperative with the mining industry. It has made good in the past, and I believe, just at this time, is a very favorable period for re-establishing its usefulness.

You all know that during this period of stress and discouragement when the Bureau should be most vigorous and be giving you the greatest possible aid, that the money with which it has to work has been steadily dwindling, although the call for services have been steadily increasing. You may feel that that is an imposing situation for a new Director to face. We should now, I think, aid industry as never before.

I am not mentioning these things in any spirit of complaint and I want to assure you, if you will look at the figures, you will see that it is not the result of any particular administration, it is not due to any of my predecessors in the Bureau. It is supposed to be due largely to measures of economy in government. I think it is possibly due to other causes, perhaps, more than it is to that.

I am speaking to you now as one of you, viewing the Bureau from the outside. I think we of the mining industry are really principally to blame for the present situation. We have had a tendency always to be individualistic. We do not care much about the advice of the other fellow and we have a hard time getting down and agreeing with one another. I know as individuals, as mining corporations, and even as separate divisions of the industry itself, there has been very, very little cooperation many times in the past. That is one of the reasons for the present status of the Bureau of Mines.

The economy measures naturally applied to those people who did the least kicking. That is generally the case. It is easy to take things away from a person who does not resist.

To me, in the short time I have been in Washington and have begun to study the field stations of the Bureau, it has been most astonishing that the Bureau has held together at all. I wish to compliment my predecessor on preserving its existence. It is, of course, reduced to a skeleton, but a good job has been done in keeping together at least the essential features of the organization. It is possibly due largely to the old-timers in the Bureau who love the work and have that indomitable mining spirit that always expects something good to turn up. You can depend on them to form the old guard around which a great Bureau of Mines can now be rebuilt.

The Bureau has been in much the same situation as individuals all over the country during these hard times. We have all suffered. There comes a time in such periods as this when a fellow needs a friend. Just a little boost at the right time may prevent a man from becoming down and out and may give him a new start for a fresh and important career. Such is the status of the Bureau—it needs a boost and it needs friends just at this time.

There have been some criticisms leveled at the Bureau. I do not take them very seriously. They have been made mostly by people who do not understand the situation. The Bureau is not in its present state for lack of organization or lack of devoted men in the service. It is in its present state entirely on account of the lack of money and men to do the things that need to be done.

I am going to give you the highlights of the financial situation. There is probably nothing inappropriate about giving you the picture.

For the fiscal year ending June, 1934, the appropriation was about $1,500,000, but the Bureau was allowed to draw from the Treasury only $1,148,000, which is 26 percent less than Congress allotted, and it was only about 50 percent of what the Bureau has had in its normal times, say in 1929. It was three-quarters of a million dollars less than in 1933. Think of that situation arising in a corporation.

Overnight, on June 30, 1934, at the end of the fiscal year, it was necessary for the Bureau to reduce its field of activities about 40 percent, discharging expert employes and cutting off services of very great value.

In the 1935 appropriation there is another quarter of a million dollars less than appropriated in 1934. So you see

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* Director U. S. Bureau of Mines.
† Presented September 26 to the Western Division Meeting of The American Mining Congress, San Francisco, Calif.

there is quite a hard, steep trail to follow to get back to the old level.

I might state, however, that there is one pleasant circumstance. We are back where we belong in the Department of Interior. We are in a friendly atmosphere. We will be where we can carry on our association with the U. S. Geological Survey, and the General Land Office, and those people with whom we have to work. But more important, we have the interested cooperation of the Secretary of the Interior and he has at his elbow men who are really deeply interested in the mining industry.

Mr. Slattery, Assistant Secretary of the Interior, was with Secretary Lane and he took a great part in the original organization of the Bureau of Mines in getting it officially started in Washington. Mr. Chapman is also interested in the mining industry.

President Roosevelt has been developing a more and more interested attitude toward the industry, as I shall tell you in just a moment.

At the present time the Bureau, as you perhaps have already heard, is very badly housed. We are scattered in seven different places. That makes administration difficult. But the Secretary has promised us quarters under one roof just as soon as it can possibly be done. It might take some little time but it is coming.

Let me mention some of the services that have been reduced.

One of the most popular services of the Bureau and, to my mind, the most important, has been the Health and Safety Division. Hundreds and hundreds of lives have been saved by scientific study of methods for the prevention of accidents. But now nine of our eleven rescue cars, that used to rush to a disaster, are out of commission, unmanned, standing on sidings on the railroads.

The First Aid and Safety training, which formerly was given extensively to miners and to graduating students in our mining schools, I have watched with very great interest, a very thorough and effective course in the saving of life and the prevention of accidents. This has been cut down to less than half of what it was only a year or two ago. Mr. Callbreath was telling us last night of his experiences with this branch of the Bureau work and of the remarkable cases of the elimination of fatal accidents, or even serious injury as a result of such training.

Another thing that has been stopped altogether is explosive research. Those familiar with coal mining realize that that study has always been a means of saving many lives. The research in permissable explosives and also permissable equipment, electric appliances and lamps, and that sort of thing, has all stopped, with the exception of one man who makes the necessary routine analysis of explosives from time to time.

Apart from the humanitarian view, accident prevention has paid for itself a thousandfold in the mining industry. Nothing much more need to be said about that.

Our mineral technology has been kept alive. At this time I feel that it ought to be expanded to dimensions that it never had before. It has served in the past to discover and invent processes, and perfect methods, for making and increasing profits in mining. At this particular time, when prices are low, such work is very imperative, but is curtailed.

It may be many, many years before two of our metals, at least, will reach very much higher price levels than they are standing at now. That simply means, unless those mining operations are going to disappear from the world, that we must cheapen every step in producing the metal. We have got to find new processes, we have got to create new uses, we have got to build new markets.

DR. JOHN WELLINGTON FINCH

That is a real study and one which the Bureau, I hope, may undertake.

Another aspect of the mining and technical research is such fundamental research as is going on at the station in Berkeley. From that scientific approach into the unknown, springs our really great discoveries for commercial application in our mining.

I want to urge you to retain the sentiment for the maintaining of all our stations. Two or three of them have had to be abandoned temporarily, but I hope they may be resumed. Many of you have had occasion to use those stations, and those of you who have done so I know appreciate their value. They do special things relating to the particular locality or section in which they are located and, to my mind, this is a very important work. As a matter of fact, it is the means by which the Bureau keeps in touch with the whole mining country.

We have another condition which will not take me long to state. The President has ordered studies of the mineral industry. He wishes to have for himself a better understanding of the place of mining in the commonwealth. We wishes also to help it.

In a recent issue of the *Engineering and Mining Journal*, commenting upon my appointment, they viewed with some alarm the danger that I might go extensively into economics. I wish to assure them that they may have the satisfaction of seeing their prediction fulfilled, because that is precisely what I propose to do.

At the President's request, the committees that have been studying the subject have brought to light the fact that we have a vast body of knowledge, fact and information in the Bureau of Mines that can be worked into very useful results and conclusions for the mining industry. We also find that one other organization, the Mineral Section of the Bureau of Foreign and Domestic Commerce, has been assembling similar figures along slightly different lines. There is a proposal, and I think it is sufficiently well on its way so it can be mentioned, to get these services together in the Bureau of Mines. That will enable us to make some real economic studies; whereas in the past they have been strictly statistical studies.

These things have been happening to us: We have had vanishing markets, we have an accumulation of huge surpluses of metal, and we have had a flood of cheap foreign production that has affected us or is ready to submerge us. Important foreign markets are barricaded against us; we have a deplorable state of unemployment, which is one aspect of prices; we also have high wage levels. We have one other very striking factor which has developed during the depression, and that is the recycling of scrap metals, affecting lead and copper principally. The extent of that we cannot, just at this time, put into figures, but we are after those figures. To some of you who are not familiar with that movement it will be astonishing to know how much new production is being replaced by the return of scrap metal. It is a fact that we have to take into account, and a very serious one.

As I look at it, one of the Bureau's most important functions is to learn why these things have happened, what we can do to prevent their recurrence, or to alleviate the effects of recurrences, if they do come, and seek a remedy. It cannot be done by mere statisticians and clerks. It has to be done with men of technical and mining knowledge so that the figures can be made of meaning.

We all know, of course, that we are still carrying the scars of the Great War when temporary demand caused us to overdo our production capacity. We have to face the fact that there is no longer an insatiable demand for all the metals. We must reconcile the rate of

(*Continued on page* 37)

Wheels of Government

FOR MANY MONTHS the mining industry has been reasonably familiar with the special presidential committee studying the natural resource industries, with a view of recommendations for economic planning in production and distribution of their products. Attention was focused on the mining industry as a result of the publication of the first part of this report, issued by the National Resources Board of the administration the middle of December.

There is plenty of reason to suspect that the so-called natural resource industries will come in for considerable attention during the coming months. Not alone will they be subjected to minute scrutiny with a view to stabilization and conservation, but they will be made the target for much experimental legislation. Perhaps the base industries, such as mining, are more intricately involved in proposals for economic security, such as the 30-hour work week, unemployment insurance and old-age pensions, than other industry. With four bills now definitely written, and awaiting Congress convening, the possibilities are great that these industries are in for considerable excitement.

With the imminence of the convening of the Seventy-fourth Congress, a brief glance at the possibilities in the way of legislation is in order. One of the first of these is legislation to be proposed for silver. There seems little likelihood at this time that legislation of this character can be passed, but it is anticipated that many bills will be introduced, and that much discussion will ensue. The Northwest Mining Association at its annual meeting went positively on record advocating legislation reestablishing silver in our monetary base at 16 to 1. The investigations now being conducted by the administration into the silver situation in Europe and the Orient may produce considerable discussion. It is understood that the Treasury Department is averse to legislation involving silver, at this time.

It is inevitable that much legislation will be proposed based upon the Resource Board's recommendations, calling for financial assistance, and moves to raise prices of those mining products suffering from overproduction. The method of furnishing that assistance has not as yet been outlined.

While the NRA conference called for January 9, to discuss price-fixing provisions of codes, may change the picture considerably, it now seems apparent that several bills will be introduced to solve this problem.

It is anticipated that a general barrage of social or labor legislation will be introduced. Chief among these will be the proposals for the 30-hour work week, which has the active backing of the American Federation of Labor, and some few industrialists. The majority of industry's executives are definitely against this proposal. The American Mining Congress, at its Western Division meeting in September, adopted resolutions expressing its feeling of the undesirability of any such legislation. This meeting spoke for fully 80 percent of all the metal industries. Again at its annual meeting, held December 13-15, this organization passed resolutions against this proposal, pointing out the inestimable harm that would accrue to both industry and worker should such a bill become a law.

The mining industry is also vitally interested in proposals either continuing or abolishing the National Industrial Recovery Act. .This legislation terminates June 16, 1935. The majority of the mining groups are now working under codes of fair competition developed under NRA.

If it is permitted to expire without the enactment of further legislation in the Seventy-fourth Congress, the producers of natural resources are again face to face with their 44-year-old problem, the Sherman law, which took little cognizance of the problems of the natural resource industries. It is essential that there be stabilization of the natural resource industries, and some measurement of production to demand. This we have been told is not permissible under the Sherman law. In the practical application of the conduct of codes of fair competition under the NRA restriction of production is permitted. This permission under the proper guidance for the protection of the consumer and in fact for the welfare of all must be still made available in times of need.

The tariff question promises to be a lively one during the coming months. The hope held highest in the enactment and in the original administration of the NIRA was the employment of American labor. Fundamentally the conditions of the terms of employment of American labor contemplates the distribution of the goods which it produces. Fundamentally also there can be no such distribution if the goods produced by foreign peasant and coolie labor are permitted to displace in the domestic market the products of the American workmen. In the distribution of our goods in foreign markets our only protection lies in improved technique which will develop low production costs or new and desirable articles which the foreigner will buy. Duties on approximately one-third of the goods brought in from foreign countries are necessary only in the amount, however, which will equalize the difference in wages between the workmen of this country and the workmen of the low-wage foreign nations.

We shall undoubtedly see some special legislation in behalf of the Bureau of Mines.

The National Committee on Rehabilitation of the Bureau has made definite recommendations for increase in appropriations for the Bureau, asking that it be given $2,000,000 annually to carry on its work in behalf of mining. They base their recommendations upon the needs of the industry and a matter of fairness to those industries in receiving a just share of the substantial tax they pay to Government. The valuable work of the Bureau along research, safety, and statistical lines has been curtailed 40 percent of what was already a very meager appropriation.

A speedy decision on the question of industrial store scrip payments and payroll checkoffs is expected, probably before the January 6 expiration date of the present stay order of the code section which prohibited scrip and payroll checkoffs. The number of representations made to the NRA in connection

with this subject by numerous organizations, among which the American Mining Congress took a leading part, is believed to have convinced high officials of the NRA that the original prohibitory order was inadvisable. Washington commentators expect that the entire section relating to the proscribing of scrip payments and payroll checkoffs in industrial stores will be eliminated.

Increasing attention by the Administration to keep the regular budget of the Government at a minimum is noted. One reason for cutting wherever possible in each of the regular agencies is that provision must be made in the next fiscal year for return of the pay cut. This return must be made without unbalancing the ledger.

The House Committee has been in action, the Ways and Means subcommittee on taxation, now recessed until the end of the year. Administrative provisions of the revenue law have been before it. Practically no attention has been paid to rates. The probability is that rates will come in for little treatment, except regarding the excise taxes due to end next year. This Committee has for reference the recommendation of the experts who studied the British tax system during the summer. On the basis of their findings abroad, they suggest decentralization of tax authority through extending and improving the field forces of the revenue bureau. They would keep appeals to a minimum and restrict suits for refunds. They would have the losing party pay expenses of the winning party in tax cases as a means to this end. They recommend also simplification of administrative provisions of the tax law. More specifically they advise a re-statement of the income tax law, but only after long study by advisors from the Treasury, the bar, and the accounting profession. The opinion in both executive and congressional circles is that such a study will be forthcoming and that legislation will be shaped on the basis of such research.

So far as the Ways and Means subcommittee, Treasury members, and the Joint Committee on Internal Revenue are concerned, nothing concrete has yet been determined. More and more it becomes evident that budgetary figures will have a great deal to do with taxation, although there is a definite feeling against any increases.

By and large the general opinion is that there can be some decreases in taxation, although the budget may be nearly as large as that of the last fiscal year, based on a large revolving fund for emergency expenditures which the President may demand on the premise that unused amounts will be returned to the Treasury.

Most special taxes are likely to be continued, such as automobile, gasoline, and other "luxury" types. Check tax is likely to be allowed to expire. Restricted depreciation allowances are another possibility while the British report goes into the limited allowances made for depreciation allowances and raises the question of whether the allowances should be limited under U. S. laws.

Because difficult to administer, the tax on trading profits of nonresident aliens is likely to be dropped. Liquor taxes are not likely to be reduced although attempts to reduce liquor prices will be made through lower liquor tariffs by means of trade bargaining. Although as the Committees meet there are likely to be startling tax proposals, it is important to remember that those which are finally enacted are those decided upon by Administration leaders. There is almost certain to be revision of many administrative provisions in an effort to tighten still further existing tax loopholes, this being the major tax effort schedule.

IN ANNOUNCING the *Minerals Yearbook* 1934 the United States Bureau of Mines wishes to point out to the mineral industry that the supply of copies available for distribution is limited. Following the example of the *Minerals Yearbook* 1932-33, the new volume carries forward the statistical information and economic discussions of mining printed in various former publications including Mineral Resources of the United States, which was issued annually for over half a century.

When release of the first *Minerals Yearbook* was announced in August 1933, as an innovation among Government statistical reports combining complete data on minerals with promptness of publication, the demand for the volume far exceeded the supply. More than 1,600 copies of the *Yearbook* were ordered before it was off the press; a second edition was practically sold out before it could be delivered by the printer; and a total supply of 6,300 copies was soon exhausted. Long after the book was no longer available many orders were received by the Government Printing Office from those who had a serious interest in the welfare of mining and who tardily realized the import of the Bureau's change in publication policy.

The 1934 volume is larger than its immediate predecessor and incorporates many improvements based on constructive suggestions volunteered by engineers in the mineral industry. In addition to accurate official data on all commercially important minerals, there is a resume of the principal economic trends in mining, and chapters dealing with progress in coal utilization, petroleum and natural-gas production, refinery technology and mine safety. A new chapter summarizes data on world mineral production and a chapter on helium appears for the first time. Developments under the National Recovery Administration are reviewed in the commodity discussions and the treatment of gem minerals has been expanded. Official proclamations and regulations pertaining to gold and silver are assembled and reproduced, supplemented by complete reviews of metal mining in the various States.

Mining engineers and executives will find the *Minerals Yearbook* an indispensable tool and will appreciate the convenience of having the data condensed into one volume of 1,154 pages and 72 chapters. All statistical material is presented in concise summary tables and 106 graphs illustrate at a glance the principal trends in various branches of the mineral industry. A complete index adds greatly to the reference value of the volume.

Copies of the *Yearbook*, in blue cloth binding, may be purchased at a price of $1.75 from the Superintendent of Documents, Government Printing Office, Washington, D. C. That official and that office are in no way connected with the Bureau of Mines, so no money derived from sales of its publications reverts to the Bureau.

THE COLLEGE OF MINES, University of Washington, Seattle, announces a continuation of its Annual Mining Institute to be given during the week January 21 to 26, 1935, at Mines Laboratory. This will be the eighth consecutive year in which the winter session has been held. Following the procedure developed in past years, lectures will be given during the forenoon hours by members of the mining, metallurgical, and ceramics staff of the college as well as by faculty members in related departments of the university. Special lecturers from the industry will be invited to address the meetings. Laboratory demonstrations and procedures will be given during afternoon periods, and a special field trip is being planned for the last day of the week. The sessions are open to all persons interested in the mineral industry. No fees are charged, and no registration formalities are required. Events are carried on daily in regular order on a schedule that permits attendance at a single lecture or the entire session. Detailed announcements and programs will be available at a later date. Further information can be obtained by addressing Dean Milnor Roberts, College of Mines, Seattle.

STATISTICS MADE PUBLIC by the Internal Revenue Bureau giving preliminary figures as set forth in returns up to August 1, 1934, the Bureau showed:

That out of 472,174 corporations making returns, 104,702 reported net incomes, a gain of 25,927, or 33 percent over 1932. Their net income amounted to $2,506,078,279, a rise of 35.3 percent over the total shown by 78,775 companies that reported net income for 1932. For 1929, of the 495,515 corporations making reports, 263,768 showed net income. Latter amounted to $10,261,307,144.

The average net income of 3,660,105 individuals making reports for 1933 was $2,963, against an average for all returns of $2,974 in 1932, $4,245 in 1931, and $6,132 in 1929.

The number of individuals reporting million dollar incomes increased to 46, against 20 in 1932. In 1931, this class totaled 75, and in 1929, 513. (American Metal Market.)

Of all things . . .

The worried creases which these past few weeks have beset Senatorial and Congressional brows weren't all due to the problem of balancing the Federal budget. . . . This business of selecting a Speaker turned out to be a very trying affair. . . . It brought even the Vice President out of retirement. . . . Mr. Garner was having a great time in his own quiet vice presidential way, shooting at wild turkeys, deer, an occasional bear, down in Texas. . . . A lot of people had even forgotten just what state the Vice President was from. . . . And then he had to fall out of a tree (he says he jumped out) and get his name in the papers for the first time since he was elected.

Learning where he was, "they" wired Mr. Garner that he was needed in Washington. . . . But nobody was fooling Jack Garner. . . . Since when was a Vice President needed in Washington before the Congress convened—or after, for that matter? . . . He'd arrive on the opening day and not before. . . . It was then, a confiding soul has it, that a message was sent from down Georgia way.

So the Vice President, mumbling about a situation which brought him to Washington and work a whole month earlier than ever before in the 30 years he had been coming to the Nation's Capital, clambered into a private railway car and came on. . . . Twenty-four hours after he arrived and after conferring with "his nibs" (his private nickname for the President), he promptly issued a statement that the Administration would keep hands off the battle for the Speakership.

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Anyway the Speakership race had one stimulating effect. . . . It not only brought a lot of national legislators to Washington earlier than usual; it brought a college campus fraternity rushing air to the Nation's Capital. . . . There hasn't been as much pledging and "early rushing" seen in years. . . . Some of the fledgling Congressmen, who were practically met at the depot by veterans and were amazed by the cordial back-slapping with which they were welcomed and the way their wives were invited to social events, are in for a sad awakening.

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The old North-South question which has always plagued a Democratic Administration is causing plenty of rabid discussion behind the scenes. . . . There is open animosity to the fact that the fidelity of the "solid South" should give its representatives the balance of power. The opinion of Mid-West, Eastern, and far Western Democrats was expressed bluntly by one spokesman who declared "It took the East and Mid-West to elect a Democrat. Roosevelt couldn't get to first base without more than the 'solid-South.' If the Democrats want to stay in power, they better let somebody beside Southerners run the Government."

There are sparks in the situation which may ignite a conflagration. There is open resentment over the traditional seniority rules which insures the chairmanship of a majority of the committees to the Southerner merely because the South votes Democratic year after year, thus permitting uninterrupted service for a Southern Democrat while his Northern running mate loses out occasionally during a Republican landslide.

Southerners hold more committee chairmanships than all the rest of the country combined!

Figures like these are adding fuel to the fire: Out of 38 important House Committees in the last Congress, Southerners held 23 chairmanships. More provoking yet, they headed 10 of the 11 most important committees. Of the 27 committees classed as semi-important, the East and Northeast had seven; the border states, three; the Middle West, three; the West, one; and the South, thirteen. The South held three chairmanships of the nine unimportant committees while the Middle West had three, the border states had one, and the East had two.

The election disposed of 10 committee chairmen in the House. . . . If the same seniority rules are followed and each eligible selects the most important chairmanship open to him, the South will have 27 important committee chairmanships in the new House! The East and Northeast will come out with eight; the border states and the Middle West with five each, and the West with two.

Northern legislators were nettled last session when jobseekers reported to them that unless an aspirant said "yes suh" and established a line of Confederate ancestry they received a cold shoulder in many departments. The nettled feeling has been replaced by one of deep resentment among those returning. . . . It is having its effect in the struggle over the Speakership and leaders. . . . More important yet, its repercussions are likely to be felt later in the session, particularly because of the unwieldy majority and the knowledge that a united front is not needed against the puny Republican forces.

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It isn't likely to become a public issue but with all the money being spent on public works it seems like something could be done about the lights over the gateways in and out of the White House. . . . Visitors along Pennsylvania Avenue get their first impression of the White House from the old fashioned rectangular glass-enclosed box fixtures which ornament each side of the gateway. The fixtures themselves are quaint and rather pleasing. But the glass looks like it hasn't been cleaned since the British invaded the Capital. . . . The rays of the electric globes barely pierce the gloom of the encircling glass. . . . Their dim pallor resembles for all the world a winking carbon filament in a mine shaft. . . . The whole is probably tied up with the present economy move.

ANNUAL MEETING—

The American Mining Congress

THE ANNUAL MEETING of The American Mining Congress was held at the Mayflower Hotel, Washington, D. C., December 13-14-15, and was attended largely by the executive personnel of the various mining groups. The program covered a wide range, and was designed to bring out the attitude of the mining industries upon the important problems that are facing them. At the meeting of the National Board of Directors, Howard I. Young, president, American Zinc, Lead and Smelting Company, was reelected as President of the organization for 1935. The following directors were elected to office: J. R. Hobbins, vice president, Anaconda Copper Mining Company; Donald Gillies, Corrigan-McKinney Steel Company; Howard I Young; Eugene McAuliffe, president, Union Pacific Coal Company.

Of special importance was the action of the Board in creating an entirely new position in the organization—that of Secretary Emeritus, to which office J. F. Callbreath was elected. Mr. Callbreath will give his full time to the work of the organization, but will be relieved of the arduous task of the secretaryship, which will be assumed by Julian Darst Conover, formerly executive secretary of the American Zinc Institute. Thus Mr. Callbreath will have more time to devote to many of the problems of serious import to the industry. Mr. Conover brings to the organization a wealth of experience in the mining field. A graduate of the University of Wisconsin, he brings both technical and practical operating experience to the work. For some time he served as secretary of the Tri-State Zinc and Lead Ore Producers Association, serving the Missouri, Kansas, Oklahoma Zinc District. Later he was selected as executive secretary of the American Zinc Institute, where he has served with distinction. With this strengthening of the hands of the organization, it is better equipped to serve the mining group than at any time in its history.

The convention developed a series of recommendations, to form the base for the policies of the organization during the coming year. These recommendations, presented through the Resolutions Committee, are as follows:

General Policies

The American Mining Congress representing the great affiliated mineral industries of the United States other than those of oil and natural gas is mindful of the many problems which confront these industries in their efforts to establish or to reestablish themselves under sound economic conditions in the interest of the general welfare not only of the owners and employes normally dependent upon these industries for their livelihood, but also the people of our country whose standard of living, if it be maintained upward, is vitally dependent upon the greatest utilization of our mineral resources in the creation of national wealth.

With the purpose of helping to direct along constructive lines the political and economic forces which are at work in our country and which have a vital bearing upon these problems, the American Mining Congress in convention assembled at Washington, D. C., December 14, 1934, herewith presents as the consensus of opinion of its members the following statement of policies.

The American Mining Congress records its willingness and intention to cooperate whole-heartedly with the Government in advancing and expediting national recovery.

In any cooperative program the industries engaged in the recovery of the natural resources of the nation are confronted with problems peculiar to themselves. The insurance of the national defense, the conservation of these vital natural resources, the preservation of developed reserves, the encouragement of further exploration and the carrying on of production in an orderly manner with a minimum of waste, require comprehensive industry planning if cooperation is to be made effective.

We affirm our belief in the principle that our industries are fully capable of self-government and, if given the opportunity, can and will speedily take the necessary constructive action now urgently desired. To do this, however, they must be permitted under a reasonable relaxation of the anti-trust laws legally and freely to formulate and agree upon plans and programs looking toward such regulation and stabilization.

It is recognized that some form of governmental consent to such cooperative action is both proper and desirable in order to safeguard industry itself and the public interests, but such acquiescence should at no time assume the form of governmental management.

We endorse in general the principles announced in the resolutions adopted by the Western Division of the American Mining Congress at its meeting on September 27, 1934, and specifically we repeat and reaffirm the following policies there announced:

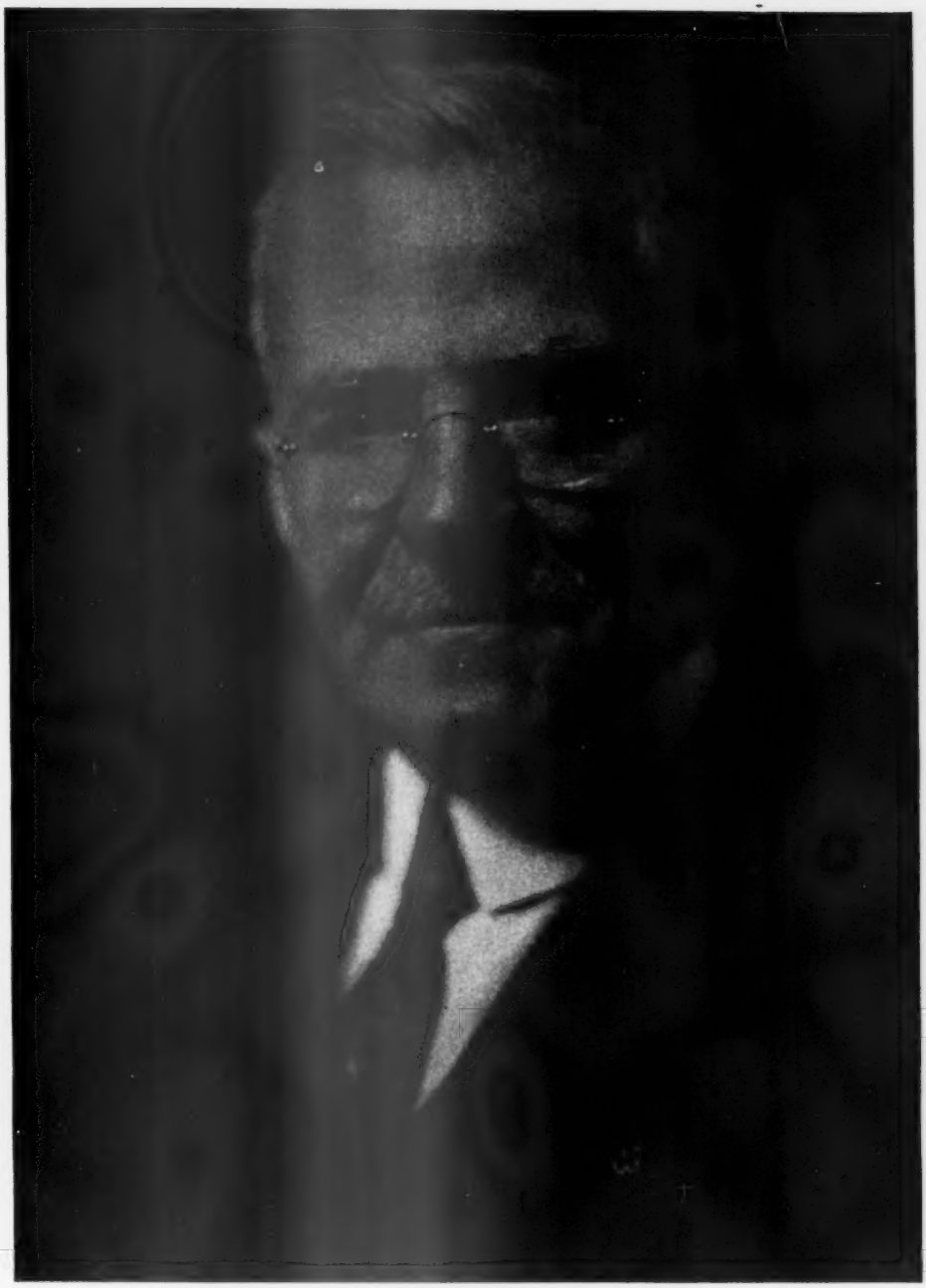
The mining industry is dependent upon a general recovery of all industry, its products go largely into the manufacture of those goods needed for plant extensions, heavy machinery, building operations and replacement of transportation equipment. Unfortunately these industries show small signs of recovery. Tremendous surpluses of the products of mines have accumulated. Uncertainties retard long term investments necessary to recovery in the capital goods industry. Until these uncertainties are removed, the mining industry must continue to stand by, a sufferer partly because of policies not clearly defined.

The labor policy of the Government, beginning with the enactment of Section 7 (a) of the National Industrial Recovery Act, has not only added to the cost of production of metals and fuels, but likewise has added to the cost of production of machinery and supplies and has created a feeling of uncertainty which militates against future commitments and undertakings.

We believe that labor is entitled to the highest wages that industry can pay. The amount which can be paid to labor is measured by the income less necessary deduction for maintenance and extension of production facilities, for the payment of taxes, for the finding and development of ore to replace that which is used up in the course of operations and for a return on the capital invested in amount necessary to retain it in the industry and attract new capital when needed. We believe, therefore, that the establishment of wage levels by legislation or fiat of governmental authority is contrary to sound economic principle and is opposed to economic recovery. Wages are paid from

JULIAN D. CONOVER
Newly Elected Secretary of The American Mining Congress

Mr. Conover has a wide knowledge of the mining industry, having engaged in mining engineering and geological work in Alaska, Idaho, Arizona, Brazil, and the Lake Superior region. During the war he served as a Major of Heavy Artillery in the United States Army. He has also been active in commercial and public relations work, having been the first secretary of the Tri-State ore producers association, in the Joplin-Miami district, and more recently secretary of the American Zinc Institute, where he organized and has been directing a trade promotion campaign for increased use of zinc-coated materials.



J. F. CALLBREATH
Secretary-Emeritus, The American Mining Congress

Lawyer and mining authority. Elected Secretary, The American Mining Congress 1904, in which capacity he has served the mineral industries with distinction and efficiency. He will continue to give his full services to the organization which will have the benefit of his advice and counsel.

income and income is not created by law but only through production of goods.

Inasmuch as eight hours is an entirely reasonable daily work period and inasmuch as the work or shift cycle in practically all mines and in most others lines of industry has been built up and adjusted to such work day, and as any reduction in the number of daily work hours will work untold hardship upon the mining industries as well as upon those who labor in mines, we strongly urge that there be no attempt to shorten the working day by law.

We oppose specifically any legislative proposal to shorten the working day and to restrict working time to 30 hours per week.

The mineral industry is subject to severe seasonal as well as cyclical demand, and no restriction as to days per week worked, other than the recognition of legal holidays, should be imposed upon the industry.

Restrictions upon the investment of capital in all industries are major factors in the continuance of the depression. Particularly does this apply to the mineral industry. Plant extensions, new commercial enterprises and building operations are constantly dependent upon new capital investments. The mineral industry is in thorough sympathy with legislation and administration designed to curb practices which contributed toward the collapse of our credit structure.

We believe, however, that it is useless and unsound to assume that because of present hardships which are largely an aftermath of the World War, of public and private extravagances during and since the war, we as a people should digress further from the proven, sound and sensible economic policies to which we owe our past unequalled prosperity and progress. On the contrary we should hold fast to these proven policies.

We adhere to and believe in the traditional form of constitutional, representative Government established by the founders of this Republic.

We urge stabilization of monetary policies and definite assurance that taxation shall be used only as a means of securing necessary revenue and not as a means of redistributing wealth.

We believe that the very great increases in Federal income and estate taxes, together with income and estate taxes now imposed by practically all of the states, constitute a total tax upon profits and savings which is unjust and confiscatory, and that such tax is forcing capital, which should go into new undertakings and capital investments, into Government bonds and other liquid securities in order that upon the death of their owners, estates may quickly meet the demands of government for a major share of the value of estates in cash.

We believe that by going beyond reasonable tax limits on estates, Congress and the states have so imperiled invested accumulations of wealth and so removed the possibility of net gain to investors as to discourage almost completely new undertakings of major importance and thus to retard recovery and the return of normal employment.

While recognizing the wisdom of some temporary relief to debtors we view as unsound any and all moves to relieve debtors from the obligation to pay their just debts and to destroy the integrity of valid contracts. We believe that it is obvious that any and all such moves will make capital and credit more timid and conservative and work hardship upon the many who wish to borrow.

HOWARD I. YOUNG
Re-elected President, The American Mining Congress

We urge that the Government shall retire from business in competition with its citizens and that it shall refrain from interference in the conduct of business except insofar as may be necessary to protect the rights of all citizens.

We believe that labor should be given the right to representation in collective bargaining by those of its own selection; that the plan of proportionate representation of labor in any industry should be recognized and that the right of the individual, not a member of a labor organization, to conduct bargaining by means of his own choice, shall not be restricted or abridged. We condemn any policy which shall constitute any labor organization, national or international, the sole representative of all those employed within an industry.

Employes who desire to work should be fully protected by the police powers of constituted government and mob law should not be tolerated.

We endorse the principle that every organization of employers and employes shall be made equally subject to public authority, legally answerable for its own conduct or that of its agents, and equally subject to judicial remedy.

Bureau of Mines

The United States Bureau of Mines for many years has provided to the mineral industries and to the public a service the value of which cannot be over-estimated. During recent years, its activities have been seriously curtailed and its services and its efficiency have been greatly diminished through lack of funds. We earnestly urge that Congress provide for this Bureau an annual appropriation adequate to permit its rehabilitation as an effective governmental agency to perform the functions for which it is designed. The importance of this Bureau and an outline of the services which it should be prepared to perform are set forth in a recent booklet prepared by the Mining Congress Committee on Rehabilitation of the United States Bureau of Mines, the contents of which are herewith approved and commended to the consideration of all members of Congress, to the Secretary of the Interior, and to the public generally.

Geological Survey

The United States Geological Survey, which, like the United States Bureau of Mines, is a coordinate sub-division of the Department of the Interior and is of great service to the mineral industries and to the public, has also suffered during recent years from lack of funds, to the extent that its services are now severely impaired and restricted.

We earnestly urge that Congress provide for the Geological Survey an annual appropriation adequate to maintain its work at an effective level and to expedite as much as possible the completion of the topographic and geologic mapping of the United States and of the economic geological studies of mineral deposits of all sorts. These maps and reports are invaluable in the development of the mineral resources of our country, essential to our economic life and our national defense, and also in the development of water resources, drainage projects, highways and many other works of an engineering nature.

Some of the highlights of the program include a round-table discussion upon the problems of the industry, which was participated in by J. P. Williams, Jr., president, Koppers Coal Company; Louis C. Madeira, III, executive director, Anthracite Institute; Eugene McAuliffe, president, Union Pacific Coal Company; A. E. Bendelari, president, Eagle Picher Lead Co.; A. W. Petermann, counsel, Calumet & Hecla Cons. Copper Co.; R. C. Allen, vice president, Oglebay Norton & Co.; Charles H. Segerstrom, president, Carson Hills Gold Mining Co. A special presentation of the "Deane Plan" was made by Albert L. Deane, vice president, Lumber Manufacturers Association.

The need for cooperative action upon all of those problems of the Natural Resource Industries, of common interest, was discussed by such able authorities as Clinton L. Bardo, president, National Association of Manufacturers; John D. Battle, executive secretary, The National Coal Association; R. C. Allen, president, Lake Superior Iron Ore Association; Dr. Wilson Compton, secretary, National Lumber Mfgrs. Association.

Special meetings were held of the National Committee for the Rehabilitation of the United States Bureau of Mines; National Tax Committee; Operating Section, Coal Division; and Board of Governors Manufacturers Section.

The annual dinner was presided over by the Honorable E. C. Alvord, as toastmaster, and a distinguished list of guests were introduced.

The various groups functioning under the auspices of the organization, presented reports upon their activities, and these are published in this issue, with the exception of the report of the National Tax Committee which will appear in our February issue.

REPORT BY J. F. CALLBREATH
Secretary,
The American Mining Congress

A year ago we said in our report that "the mining industry has been buried deep in a tremendous readjustment period, facing production and financial loss on the one hand, and government regulation and uncertain political action on the other." The picture for the mining industries during the current year has changed but little. While the industry has made progress and faces the immediate future with greater confidence than it did 1934, the situation is far from satisfactory. Every effort has been made to work out satisfactory working conditions under the Codes of Fair Competition, but we are still in a definite period of readjustment.

The mineral industry as a whole is at this time confronted with problems of great magnitude, and a solid united front is essential if we are to retain the individual initative that has made mining the second greatest industrial unit of the nation. Proposals that threaten the future of our great industry have the support of thoroughly organized groups. The mining industry must not sit idly by and permit these agencies to destroy what it has taken years of effort to develop.

The American Mining Congress has been in the midst of the Washington-Merry-Go-Round. Even the trained Washington observer has during the past year treaded his way among the devious paths with caution. The wheels have been moving fast and with furious activity. It has been difficult to keep apace with the alphabetical parade. Considerable attention was focused upon Congress and its proposals. The 73rd Congress had before it a total of 15,101 bills. About one-fifteenth of these became laws, the balance falling by the wayside in the numerous traps and backwaters. Out of this mass of proposals 976 laws were enacted. These included such tremendous proposals as appropriations of approximately 7 billion dollars; revised tax laws; giving the President power to raise or lower tariffs; placing communication companies under Federal control; giving definite power to the Federal Labor Board to supervise elections for collective bargaining.

LEGISLATION: Among the legislative activities of serious import to mining in the year 1934 the following stand out:

1 The Revenue Act of 1934
2. The 30-Hour Week Bill
3. The Wagner Bill
4. The Wagner-Lewis Unemployment Insurance Bill
5. The Securities Exchange Bill, embodying treatment of the Securities Act of 1933
6. The Tariff Bill of 1934
7. Silver Legislation

Revenue Bill of 1934: In the preparation of this act, the sub-committee of the Ways and Means Committee recommended an arbitary reduction in the depreciation and depletion deductions of 25 percent. This program was accompanied by a recommendation contained in the statement of the Treasury Department calling for the elimination of discovery and percentage depletion. There were numerous other recommendations in these two reports considered by the Ways and Means Committee which were adverse to the well-being of the mining industries. In the course of the development of the bill, reasoning and better judgment prevailed on the part of the legislators charged with definite responsibility and these wholly unconstitutional recommendations against the proper deductions for the mining industries in the matter of aging equipment and wasting mineral assets remained in the act as finally passed and approved. The unwisdom of eliminating consolidated returns, an action taken when the Revenue Bill had reached the floor of the Senate is daily becoming more apparent. When it is realized that the practice of making a consolidated net income statement for the purpose of income tax returns was put in the law in 1917 at the request of the Treasury Department, the difficulties of administration with which that department is now faced, can be appreciated. It is to be hoped that reason and judgment will again prevail to the extent that the right to make a consolidated return will be restored by the coming Congress.

30-Hour Week Bill: This legislation previously considered in 1933 was again to the front in the 73rd Congress. Here again was an extremely unwise and harmful legislative attempt, the effects of which, had it become law, were not understood by the public at large and hence not thoroughly appreciated by all of the public's representatives in the national Congress. The Department of Labor and the National Recovery Administration realized the harmful effects of freezing a maximum hours work week into law. As is well known, the average working hours developed under the NRA codes is approximately 40 hours per week. This 40-hour work week, which in most instances is flexible for the meeting of peaks and emergencies, was determined by careful consideration between the NRA and each of the industries concerned. The arbitrary setting of a 30-hour week, while attractive to the uninformed as a means of spreading employment, would have seriously disturbed our entire national business and employment structure. This fact is just as true today and will be just as true during the 74th Congress as it was during the 73rd Congress.

The Wagner Bill: The conception of this measure was most certainly not based on a knowledge of industrial working conditions nationwide. It is probable that those who have intimate knowledge of the employment conditions in the needle work industries of Manhattan Island and vicinity had in mind certain procedures which would perhaps bring definite improvement in that situation. It is just as certain that the Wagner bill, as originally written or as rewritten after the hearings, would have plunged the industries of this country and particularly the mining industries into a morass of contention, trouble and loss. As in all hearings on legislation affecting mining, The American Mining Congress told the story of its member industries to the Committee on Education and Labor of the Senate and kept its mining membership informed as to the status of the legislation.

Wagner-Lewis Unemployment Insurance Bill: This measure, both before and after consideration by the Ways and Means Committee of the House of Representatives, was considered so premature that its enactment into law did not take place. The arbitrary fixation in the bill of a tax of 5 percent on gross payrolls of industries was without definite consideration as to sufficiency or as to the effect on production costs and the consumer capacity to purchase. When it is considered that legislative enactments of this type have placed the staggering burden of 15 percent of the gross payrolls on the nation of Europe, the problem with which we are faced in legislative attempts of this nature become startling.

Securities Exchange Bill: This legislation as originally considered, contemplated a situation which would have definitely stagnated the development of ad-

ditional minerals in the United States. Through changes in the bill and through further amendments which mitigated to some extent the harmful effects of the Securities Act of 1933, a measure was enacted into law which, up to the present time at least, has not appeared to be of serious harm to mining.

Tariff Bill of 1934: It was felt from the beginning that this legislation was not necessary and there is still the probability that its administration may definitely harm some of our mining industries. As originally contemplated, no provision was made in the Tariff Bill of 1934 for hearings at which the industries affected might make appearance. The Tariff Bill of 1930 contained ample provision for the increase or decrease by 50 percent of any existing duties. In its appearance before the Finance Committee of Senate, The American Mining Congress urged that interested industries might have their opportunity for open hearings when action inimical to their welfare was under contemplation. As finally written, the act provided for hearings. In the administration of the act, these hearings were not at first open, but definite and urgent protest on the part of this office resulted in the hearings being open to the public. It remains for the future to determine what the fate of some of the mining industries will be under the administration of the Tariff Act of 1934.

Departmental Contacts: Throughout the year The American Mining Congress has continued to tender its services to all of the administrative activities of the Federal Government and in particular to the following: Treasury, Interior, State, Commerce, War, Labor, Tariff Commission, I. C. C., R. F. C., and N. R. A. This work has to do in some instances with the development and clarification of regulations under which various congressional acts are administered. The work also has to do with direct representation for the industries and needs of our members. The work so performed has been conducted in such a manner as to be helpful to the agencies of the Federal government and to our office and members alike. We are frequently called upon to assist in the clarification of problems which either directly affect mining or which may have some indirect effect.

During the year a special effort has been carried on by a committee headed by Mr. Eugene McAuliffe looking to a proper appreciation of the work of the Bureau of Mines and a better understanding by the public of the importance of the mining industry to the economic prosperity of the nation. As a part of this work a booklet has been prepared and is ready for distribution outlining the important function of mining and the needs of the industry.

Special Meetings: You will hear formal reports from the chairmen of our Metals, Coal and Manufacturers Division. They have continued their work diligently throughout 1934, and the results have been highly satisfactory. We have held two major conventions and expositions. The first is our annual coal convention and exposition, held at Cincinnati, Ohio, which brought together some 4,000 operating men and displayed the products of more than 100 manufacturers of mining equipment; the second our annual "Western Division" or metals convention and exposition, held at San Francisco, which brought together more than 2,000 operating men and some 60 manufacturers. These groups formulated their views and developed a plan of procedure which is the guiding force in their work during the current fiscal year.

The state of the mining industry today as compared with a year ago is as follows:

COPPER production in 1933 was 233,649 short tons and the average price for the year was 7.025. Production for the first 10 months of 1934 was 186,500 short tons, the average price for this period being 8.36.

LEAD production in 1933 was 265,395 metric tons and the average price for the year was 3.87. Production for first 10 months of 1934 was 299,914 metric tons,

E. J. NEWBAKER

the average price being 3.92 for this period.

ZINC production in 1933 was 294,572 metric tons and the average price for the year was 4.03. Production for the first 10 months 1934 was 295,788 metric tons, with an average price of 4.25 for that period.

BITUMINOUS COAL in 1933 was 327,940,000 tons. Production so far this year (10 months) being 298,713,000 net tons.

ANTHRACITE COAL production in 1933 was 49,399,000 tons. Production for the first 10 months in 1934 was 48,956,000 tons.

IRON ORE production in 1933 was 17,553,188 gross tons.

The American Mining Congress has continued during the year with its program of presenting facts concerning the industry. Its information presented for public consumption, wholly unbiased and fact-founded, has gone far to bring about a better understanding of the importance of minerals in our industrial life. Among the interesting facts widely disseminated are the following: Mining is carried on in more or less degree in each of our 48 states; of a total of 3,071 counties, 2,034 are mineral producers; the book value of capital invested in mines is estimated at about 15 billions; mining in all its ramifications, including fabricating and processing, employs 1,700,000 workers at an annual wage of more than 2 billion dollars, and mining per se employs more than 800,000 in its underground work at an annual wage of more than one billion dollars. The mineral industries pay some 220 millions annually in Federal and state taxes. They purchase, in normal times, 350 million dollars worth of equipment and supplies; furnish 59.9 per cent of all the revenue freight hauled by the railroads. Few, even those directly connected with the mining industries, are aware of the vast magnitude of this group. It will be our constant endeavor to arouse our own members, the public and Congress to the importance of this great basic industry.

REPORT BY E. J. NEWBAKER

Chairman, The Coal Division, and Vice President, Berwind-White Coal Mining Co.

While coal has been an integral part of the American Mining Congress since 1907, it was not until February, 1932, that a separate division was organized to look after special projects in behalf of this branch of the mineral industry.

Primarily the work of the division has been devoted to the advancement of operating practice, the major activity centering around the Annual Convention and Exposition held for many years at Cincinnati, Ohio.

At the present time the division is composed of 61 member-companies, with an active participating membership of 382 members. Practically every producing company in the country is participating in a more or less degree in the work of the division, whether it be an active or participating member, or merely through sending of large delegations to the Annual Convention and Exposition. Companies generally send from 2 to 50 of their operating personnel to this meeting to take advantage of the live discussions and to view the most recent machinery and equipment. This cooperative service between the American Mining Congress and the Coal Division has resulted in studies of operating practice that have done more to help modernize coal producing methods than all other such agencies combined.

The annual meeting of the Board of Governors of the Coal Division was held at Cincinnati, Ohio, May 8, 1934. At that time the board agreed upon certain policies and recommendations. These have been diligently pursued during the ensuing six months. At the same time a meeting of the National Board of Directors of the American Mining Congress was held in conjunction with its coal board. A special policy and finance committee was appointed to include Mr.

Paul Weir, vice president of Bell & Zoller Coal and Mining Company; Mr. W. J. Jenkins, president of the Consolidation Coal Company of St. Louis, and Mr. Eugene McAuliffe, president of the Union Pacific Coal Company. This group has considered ways and means of extending the work of the coal division to a greater number of coal companies and to bring into the division the closer cooperation of the industry.

From the financial standpoint the coal division has an excellent record for 1934, the total revenue being $46,843.17. Included in these receipts is revenue through company subscriptions, exposition, member dues and fees, yearbook sales and advertising. The cost of conducting the work for the division has been equally satisfactory and we will end the year with a small surplus.

For several years the American Mining Congress has been promoting a movement for increased efficiency in coal operating practice. This effort has been carried on through the cooperation of mining men with our annual convention and exposition, and with our committees on Mechanization, Recommended Practice, and Standardization. These activities have been carried on more or less independently of each other until the early part of this year—1934, when it was decided that better results could be accomplished by coordinating all of these operating activities under one head as a branch of the Operators Section of the Coal Division.

The reorganization was accordingly put into effect, and in addition to including the committees that had been functioning for several years, a number of new committees were formed so that the scope of the work of the operators section now includes all phases of mining—underground and on the surface. Each phase of mining, such as, cutting, drilling, loading, cleaning, etc., has a special sub-committee to cover that particular subject, and there are in all, now organized and functioning 42 committees, with a membership of 201 coal operating men. These men are company officials and executives, and they comprise the highest talent engaged in mining coal. Approximately 160 coal mining companies, in 15 of our coal producing states, operating more than 300 coal mines are included in this membership.

The membership so far is composed of coal operating men, but it is the intention to invite companies who are manufacturing mining equipment to join this work by having their representatives on these committees. Invitations to the members of our Manufacturers Division have already been sent out and these companies are expressing their willingness to take part and are appreciative of the value of what is being done.

The committees are divided into three main groups—(1) Operating Research, (2) Recommended Practice, (3) Standardization. An organization meeting of the chairmen of these various committees was held in Cincinnati on May 8, 1934, which was attended by 30 members. Quoting from the minutes of that meeting the following outline explains the purpose of each of the groups.

GEORGE R. DELAMATER

"The committees on Operating and Research are to investigate and report on experimental operations, new methods, new equipment, and improvements or changes from usual practice in present methods and equipment which are being tried. It is the purpose of this group to report on the success or failure of these new things, and to determine the governing factors or reasons for the successes or failures.

The committees on Recommended Practices are to determine what methods, equipment, and operating practices can be recommended as having proved most suitable for certain mining conditions. They are further to define the limits of use of these methods as governed by mining conditions or other factors and also are to indicate what results can be considered as representing good practice within these limits.

The committees on Standardization are to recommend sizes, dimensions and specifications for certain classes of equipment and parts of equipment that may be, through the cooperation of manufacturing companies, capable of standardization. The purpose of such recommendation is, (first) to select the general specifications or types of equipment that are most efficient in mining and (second) without interfering with the originality of design on the part of the manufacturer, standardize such sizes or dimensions as will provide for greater interchangeability of equipment and parts, and reduce the stock of supplies carried at the mine."

REPORT OF GEO. R. DELAMATER Chairman, Manufacturers Section, and Asst. Vice President, W. S. Tyler Co.

I am sure that I express the sentiments of the representatives of each of the member companies of the Manufacturers Section of the Coal Division when I say that the success of our spring expositions of mining equipment is basically due to their being held in conjunction with the annual convention of coal mine officials, and their splendid cooperation.

From the manufacturer's point of view, the outstanding feature of these expositions has been the attendance of coal mining officials from practically every state producing coal and many from Canada and other countries. This is undoubtedly the reason for the great number of exhibiting companies over and above the regular membership concerns, of which there are 47.

The following information from the secretary's report on last May's meeting at Cincinnati is of great interest: 431 coal companies from 22 states sent 1,327 representatives; 90 manufacturers exhibited and sent 884 representatives. There were also in attendance 76 of a miscellaneous character, making a total of 2,287, a splendid record considering the times.

There have been more exhibitors and there have been more coal company representatives in more prosperous years, yet there has been but two years (1931-33) in which more companies were represented. There were 431 in 1934, 451 in 1933, and 435 in 1931.

While cooperation between the coal company and the manufacturers representatives is, undoubtedly, largely responsible for this splendid record, a great share of the credit must go to E. R. Coombes, secretary of the coal division, and L. W. Shugg, General Electric Co., and honorary director of exhibits, for their splendid team work and good management of these expositions.

While this is a very satisfactory record, there is still much that can be done that will be beneficial to all concerned. A start in the right direction was made last spring by the organization of the National Publicity Committee of the Manufacturers Section. The object is primarily to bring before the public in the most effective and interesting manner everything which will tend to establish more intimate contact between the public and the coal industry and eliminate the many false impressions now existing regarding this industry.

I shall not attempt to explain in any detail this undertaking. When the secretary spoke to the committee in Pittsburgh June 26, 1934, she made the following significant statement:

"The thought expressed by various mining men is that the manufacturer of mining machinery and supplies is as definitely a part of the so-called mining industry as is the operator himself; that the industries involved are faced with serious problems, and that the operators are looking to the manufacturers to help them in every possible way. With this in view, the Mining Congress hopes to enlist the support and active cooperation of the highly trained men in its member-companies represented both in the Manufacturers Section and with the operators, in a publicity plan that will have far-reaching effect."

I feel sure the manufacturers fully appreciate the great value of any such

cooperative arrangement and will gladly lend all possible assistance.

I also feel sure that both the operators and the manufacturers fully appreciate the fact that each are of equal importance to the other in the development of equipment of greater efficiency or which will otherwise improve mining conditions.

Many manufacturers, largely through the urge to lead in their particular field, spend large amounts of money in development of new equipment and new processes. The cost of such development must of necessity be included in the sales price of the equipment produced by such concerns.

In this connection, I venture to say that the member-companies in the manufacturers section of the Mining Congress are in almost every case leaders in their line. They are the real originators of new equipment and processes of value to the industry and as such should have the full support of the operators attending our expositions. Due consideration should be given to the fact that these exhibiting companies spend thousands of dollars each year in the preparation of their exhibits and in the transportation of equipment to and from the exposition. They do everything possible to make their exhibits both attractive and instructive and lend all possible assistance in making these expositions a success.

One of the serious problems of our annual exposition is the representative of the manufacturer not exhibiting and who will not pay the reasonable fee asked for admission to the exposition. Some go so far as to obtain in one means or another the badge of an operator. Others unable to gain entrance into the exposition carry on the work in the hotel lobbies or private rooms rented for the purpose.

The operators cannot help but know these men and their methods and can quickly break up their nefarious practices and be instrumental in increasing the number of exhibitors by refusing to be entertained by such men or in any way supporting such unethical exposition attendance. Won't you operators make it your business to instruct those you send to the May convention that they must refuse to confer with or be entertained by representatives of non-exhibiting companies? If you will, our future expositions will far surpass any we have had in the past.

Regarding this matter of entertainment, I have heard some complaint among the operators that liquor entertainment is carried so much to excess that their representatives sometimes do not accomplish what they are sent to the convention for, namely, the gaining of first hand knowledge of new equipment and process development. This is a most difficult thing to break up but it can be done. The elimination of the non-exhibiting entertainer already referred to will take care of a large part of this trouble. To curb excessive entertaining by exhibitors is much more difficult. It is admittedly impossible to successfully legislate good morals. So long as there is a demand for that sort of entertainment there will undoubtedly, be manufacturers who will provide it. But here again, the monetary cost must go into sales prices and in the end you operators pay for it, even though at the time it may seem to be a gift.

This is just another opportunity for good cooperative work between the operators and manufacturers with the goal conventions and expositions of greatly increased value to both and a more wholesome atmosphere that will attract more of the higher officials of the coal and manufacturing members of this organization.

Regarding the convention meeting, it has been the practice not to permit a representative of the manufacturer to present a paper, this to eliminate objectionable advertising. His only chance is in discussion and the practice of reading papers in full frequently almost entirely eliminates that opportunity.

I personally believe that many extremely valuable contributions are lost to the American Mining Congress by this inflexible rule. This loss could be eliminated by requiring that all requests for permission of manufacturers representatives to present papers be first presented to the secretary of the American Mining Congress, who would approve such papers as he considered of real value to the coal mining industry and

E. A. HAMILTON

which are written by properly qualified and capable authors. Papers approved by the secretary should then be submitted to and have the approval of the program committee, all of whom are operators, before they could be read in the convention.

It is the experience of nearly all engineering societies that their meetings become more interesting if all papers be printed before the meeting and made available to those attending, the author only presenting a resume of his paper. Presentation of long papers always result in many leaving before the end of the meeting. Frequent change of subject avoids monotony and maintains alertness of the audience and is always reflected by better attendance.

I appreciate this opportunity as chairman of the Manufacturers Division to present these thoughts to you and sincerely hope they may be helpful in more closely cementing together the operator and manufacturer membership of the American Mining Congress.

REPORT OF E. A. HAMILTON

Chairman, Western Division, and Vice President, U. S. Smelting, Refining & Mining Co.

The outstanding feature of the Western Division in the year 1934 was the convention held at San Francisco, September 24-29. This gathering was noteworthy, not only for its unprecedented attendance, but for the character of the papers presented, the forthright platform unanimously adopted, and the determination of the participants to work together for the rehabilitation of Western metal mining.

As chairman of the division for 1934, Mr. W. S. Boyd, of the Nevada Consolidated Copper Corp., enlisted the aid of mine operators generally in the region west of the Mississippi River in a program for the rehabilitation of the industry. He appointed Mr. W. Mont Ferry of Salt Lake City, vice-president of the Silver King Coalition Mines Company, as chairman of the program committee, and the results of these activities and efforts was an unusually fine exposition of the problems which confront the industry.

Mr. Boyd also selected state chairmen in each of the states represented in the division. These chairmen conferred with their associates in their own states with the result that those who attended the meeting came as fully accredited representatives of the industries in the various states. More than two thousand operators attended the convention.

The outstanding expression of the convention was the development and adoption of a platform, or declaration of policy, which embodied five major recommendations as follows:

FIRST: We adhere to and believe in the traditional form of constitutional representative Government established by the founders of this Republic, and we demand that the next Congress reassert and reassume its traditional function as a coordinate branch of the Government.

SECOND: We demand that the budget be balanced without delay, and that the Government relief be placed on a permanent basis of law, and that it be removed from partisan politics.

THIRD: We demand stabilization of monetary policies and definite assurance that taxation shall be used only as a means of securing necessary revenue and not as a means of distribution of wealth, and that there shall be no inflation of the currency.

FOURTH: We demand that the Government shall retire from business in competition with its citizens and that it shall refrain from interference in the conduct of business except insofar as may be necessary to protect the rights of all citizens.

FIFTH: We demand that labor be given the right to representation in collective bargaining by those of its own selection; that the plan of proportionate representation of labor in any industry shall be recognized and that the right of the individual, not a member of a labor organization, to conduct bargaining by means of his own choice, shall not be restricted or abridged. We condemn any policy which shall constitute any labor organization, national or international, the sole representative of all those employed within an industry. We recognize the right of men employed in the mining industry to join or refuse to join any labor organization, and we condemn coercion by employers, labor officials or any other agency which shall interfere or limit such right.

We further demand that employes who desire to work shall be fully protected by the police powers of constituted government and that mob law shall not be tolerated.

This declaration was accompanied by a preamble which contained a well constructed and well prepared presentation of the situation. The entire document is commended to the consideration of the annual meeting of the American Mining Congress with the request of the Western Division that this declaration of policy, as well as the other resolutions approved by the Western Division at its 1934 meeting, be adopted at the annual meeting of the Mining Congress.

Plans for the continuation of the work of the Division, with complete organizations in each of the member states, were perfected at the meeting. A special conference of the secretaries of the various state organizations was held to develop a closer cooperative contact with the Washington office of the Mining Congress.

It was agreed that in 1935 the Western Division should actively undertake to create a central agency for the dissemination of information between the various member states of the division. It is expected that this agency or committee will be created by the board of directors of the American Mining Congress at the annual meeting in Washington, December 13 and 14, and that the proposal will then be submitted to the board of governors of the Western Division for its approval and ratification. The Western Division recognizes the need for activity and close cooperation in 1935, and pledges its best efforts to promote the welfare of the industry along those lines.

The last meetings of the Western Division prior to the San Francisco convention this year were held at various western points in conjunction with the Western meeting of the American Institute of Mining and Metallurgical Engineers. The program on these occasions was divided, with the Western Division devoting its discussions to economic phases, and the Institute to technical subjects. Although these meetings were interesting and profitable it was found that the arrangement did not allow sufficient time for the consideration of the many practical problems to be considered, and it was therefore decided to abandon the plan and the former procedure of an annual meeting devoted exclusively to the practical problems of the industry was re-established. The officers of the Western Division feel that the results of the San Francisco meeting fully establish the wisdom of the policy adopted, and it is the unanimous opinion of all those present, as far as the officers of the division have learned, that the 1934 convention of the division was the most important and useful gathering of mining men held in the West for many years.

The division sponsored an exposition of mining supplies, equipment, and state exhibits, in connection with its annual meeting for the Western Division at the San Francisco convention. The exposition was an outstanding success financially and in every other way. Fifty-seven leading manufacturers of mining machinery and supplies, and all the Western mining states, participated as exhibitors, and the results indicate that the exposition should become a regular feature of the division's conventions, and that special efforts should be made to develop the exposition phase of the meeting so that it should become fully representative of all phases of the industry in the division.

The officers of the division wish to express in this report their appreciation of the splendid services rendered in connection with the exposition by Messrs. Boyd and Ferry and the many other leaders of the industry in the Western states who cooperated so generously to make the occasion memorable and to President Young, Secretary Callbreath, and the Washington staff of the Mining Congress, for their guidance, assistance, and participation; and to the many distinguished men who presented the various subjects at the meeting, as well as to the members of the industry generally throughout the Western states for their presence and participation in the important deliberations that took place at the 1934 convention.

The official organization of the division for 1935 invites like assistance and cooperation in its efforts and will undertake to spare no efforts to continue the activities of the division along the lines of greatest advantage to the industry.

Message from Daniel C. Roper, Secretary of Commerce to Annual Convention The American Mining Conogress

"I appreciate the invitation you have extended to me to join you and the members of the American Mining Congress at dinner this evening, but, unfortunately, a previous engagement made some time ago makes it necessary for me to forego the pleasure of being with you. However, I am so much interested in the deliberations of your congress and in the constructive attitudes of your membership, as evidenced by the information you have given me, that I wish to assure you of my sympathetic interest and to express my hearty good wishes for the success of your deliberations.

"Neither our economic nor social problems can be wisely approached from the viewpoint of a single segment of our economic and social life. The greatly increased complexities of economic relationships has brought about an inter-dependence which links directly or indirectly every important element in our national structure. Every important division of business and industry must be studied not only from the standpoint of the internal conditions of each industry alone, but also from the standpoint of its inter-relationships with other segments. We need both the internal laboratory study and investigation and also the external coordinated research. In the former, the industry itself can function in most instances most effectively. In the latter, that is, the relationship to other lines of industry, the government can be, through its statistical studies of conditions at home and abroad, of cooperative assistance.

"While the Bureau of Mines, carrying specific lines of service to your industry, has been transferred to the Interior Department, I wish you and your associates to feel that the phases of your industry which still fall within the scope of the Department of Commerce, charged as it is with the development of trade and commerce, will be given the most careful study and attention. Suggestions from you and your members as to how we can cooperate within our properly defined duties will be appreciated and given every possible consideration. I sense my relationship to all business as that of a trustee and it is impossible to discharge this trusteeship satisfactorily unless I am kept informed as to the needs of those for whom I am a trustee, as well as becoming informed through suggestions as to how I can improve the facilities of this Department.

"With the very best of wishes for the deliberations of your conference and for the happiness and prosperity of the industry and the individuals associated therewith throughout the New Year, I am

"Very sincerely,

"DANIEL C. ROPER,
"Secretary of Commerce."

A. W. LAING was reelected president of the Winding Gulf Operators Association at its annual meeting, with L. T. Putman as vice president; P. C. Graney, secretary-treasurer, and Hal M. Scott as assistant secretary. The Executive Committee was named as follows: A. W. Laing, vice president, McAlpin Coal Co.; L. T. Putman, general superintendent, Raleigh-Wyoming Coal Co.; E. C. Minter, president, E. C. Minter Coal Co.; W. F. Tams, general manager, Gulf Smokeless Coal Co.; S. Austin Caperton, general manager, Slab Fork Coal Co.; W. A. Richards, president, Pemberton Coal & Coke Co.; L. Epperly, president, Winding Gulf Colliery Co.; J. B. Clifton, president, Lilybrook Coal Co.; and P. C. Graney, general manager, C. C. B. Smokeless Coal Co.

Improved Bituminous Operating Practice

By E. J. NEWBAKER*

THE COAL INDUSTRY has made continuous progress in the development of its methods and equipment during the period of its growth to an industry of major proportions. Progress has been more or less steady since the days when everything was done by hand, but if we review all of the changes that have taken place it becomes apparent that the adoption of mechanical methods and improvements in mining technique have been proceeding at a more rapid rate during the past ten years than at any other time. If we could plot a curve of the progress of the advancement of coal mining, taking machines, equipment and practices all into account, we would find that this curve started a sharp upward swing about 10 years ago.

Considering briefly the changes in methods and equipment that have taken place in the industry within the last ten years, we find that the old breast machine has practically passed out of the picture and the shortwall cutter is rapidly being replaced by track mounted machines which will cut in any part of the seam from the floor to the roof. This greater flexibility combined with a greater mobility has increased production coincident with an improvement in the quality of the coal, and is in turn leading toward a multiplicity of thin cuts in a face rather than one single cut at the bottom of the seam. Power drills, improved permissible explosives, the recently developed carbon dioxide and compressed air cartridges have also made possible improvements in face preparatory work.

Mobile mechanical loaders for the flat seams of Illinois, Indiana and the far West have rapidly taken the place of hand loading, while in the thin seams of Central Pennsylvania and the Anthracite field conveyors are rapidly becoming a part of the standard equipment. Both mechanical loaders and conveyors are now spreading into the southern fields of West Virginia and Kentucky. In gathering haulage the electric locomotive is taking the place of the mine mule.

Dry Cleaning Plant at Berwind-White Coal Mining Company

Main line haulage, using heavy rail and rock ballast with regular alignment for the tangents and curves, is approaching railroad specifications. Heavy locomotives, large capacity steel mine cars, block signals and trip dispatching have brought the main haulage performance to an efficiency that was not considered possible a generation ago. Surface preparation has kept pace with the development underground. Stationary bar screens have given place to shaking and vibrating screens, and mechanical cleaning by wet and dry methods has raised the quality of prepared coal to a point where guaranteed analyses have become accepted practice.

While only some of the more outstanding improvements in practices and equipment whose growth has been very pronounced during the past decade have been mentioned, these serve to illustrate that practically all the present modern mechanical methods were available to the coal industry for a great many years, as most of the equipment mentioned was invented prior to 1924. If it has only been recently that the coal industry saw any necessity or had any desire to adopt available equipment and modernize its methods, the advanced rate in the progress of mining must have been due to a change in thought on the part of mining men because the necessity for improvement has perhaps been no greater during the past decade than during earlier years. Coupled with this change in thought which has made mining men desire to try new equipment and methods there has been a breaking down of the old individualistic attitude that existed for so many years in coal mining and which had very bad effects upon progress of the industry.

What was responsible for this change in psychology is difficult to determine, but the main point is that within the last ten years mining men have been willing to discard traditional methods in favor of new ones, and also to further discard tradition by cooperating in exchanging information on what they were trying and accomplishing. Such cooperation could not fail to produce results and these results are measured by the rapid progress that coal mining has recently made. There were probably a number of factors that brought about this psychological change; however, one that undoubtedly occupies the place of greatest importance is the efforts of The American Mining Congress to bring about such a situation.

The story of its annual convention of-

* Vice President and General Manager, the Berwind-White Coal Mining Company.

fers sufficient proof for this statement. Starting in 1924 The American Mining Congress began holding its annual conventions of Practical Coal Operating Men which provided these men with their first opportunity to meet as a national body and discuss their operating problems. Combined with the convention was the Exposition of Mining Equipment with the foremost manufacturers of mining machinery represented, so that details of every phase of mining could be discussed from the standpoint of operating methods and use of equipment.

Since that time the sequence of these annual conventions has not been broken even during the worst years of the depression and it is this fact that speaks for the desire and the willingness of the operating men to tear down the fences from around their properties which the preceding generations had built up. A natural hesitation toward given intimate details of operating methods and economies did exist during these first conventions, but this has gradually given away until today papers present actual costs in dollars and cents. This would have been utterly unthinkable fifteen years ago.

In addition to the Convention and Exposition, The American Mining Congress several years ago further organized a series of committees on mechanization, recommended practice, and standardization. The purpose of these committees was to sponsor and encourage improvements in coal mining, and these activities were carried on more or less independently of each other until the early part of this year, 1934, when it was decided that better results could be accomplished by co-ordinating all of these operating activities under one head as a branch of the Operators Section of the Coal Division.

At this meeting it was decided that the first work to be undertaken was to send out a general questionnaire to all members, which would cover the general mining conditions and types of equipment which these companies are using. A compilation of this data was to be used as a basis for determining the line of investigation which each sub-committee should follow, as it will provide a definite cross-section of the mining methods by those companies whom we accept as leaders in the development of better mining practices. An analysis of what these companies are doing and why they are doing it will be of very great value in determining how far these individual improvements can be applied to other mines and other mining conditions. This work becomes more impressive when we consider that these analyses are not to be made by any one man, but through a concensus of the best talent and technical knowledge in coal mining.

The last meeting of the committees, attended by about 30 representatives of coal companies and equipment manufacturers, was held in Washington recently. At this meeting a compilation of some preliminary data that had been gathered was presented and discussed and plans were adopted for continuing the work of the committees. In addition to the special reports on various mining methods that will be made, it was decided that the Coal Division would act as a general clearing house of information on mining methods and equipment and that in so doing it would fulfill a much needed and valuable service for the coal mining industry.

COAL DIVISION — THE AMERICAN MINING CONGRESS — OPERATORS SECTION

ORGANIZATION OF COMMITTEES ON IMPROVED PRACTICES IN COAL MINING

	Projects on Operating Research	Projects on Recommended Practice
General Chairman on *Face Preparatory*	Otto Herres, U. S. Fuel Co.	H. H. Taylor, Jr., Franklin C. Co.
Sub-Chairman on Cutting	Harry LaViers, South East C. Co.	G. F. Osler, Chartiers Creek C. Co.
Sub-Chairman on Drilling	R. L. Adams, Old Ben Coal Corp.	D. A. Stout, Colo. Fuel & Iron Co.
Sub-Chairman on Blasting	J. M. Johnston, Bell & Zoller Co.	
General Chairman on *Loading*	R. G. Pfahler, Berwind-White C. Co.	G. F. Campbell, Old Ben Coal Co.
Sub-Chairman on Mechanical	R. J. Oldham, Centralia Coal Co.	R. V. Clay, Hanna Coal Company
Sub-Chairman on Conveyors	J. McCrystle, Wyo. Valley Coll. Co.	T. F. McCarthy Clearfield Bit. C. Co.
General Chairman on *Transportation*	H. B. Husband, C. & O. Fuel Mine	G. S. Jenkins, Cons. Coal Co. of St. L.
Sub-Chairman on Gathering	W. P. Young, Crescent Mng. Co.	M. D. Cooper, Hillman C. & C. Company
Sub-Chairman on Main Haulage	L. C. Skeen, Fordson Coal Co.	W. W. Dartnell, Valley Camp C. Co.
Sub-Chairman on Hoisting	I. N. Bayless, Union Pacific Co.	C. C. Ballard, New River Company
General Chairman on *Power*	P. Loftus, Cons. Engr. Pittsburgh	P. Loftus, Cons. Engr., Pittsburgh
Sub-Chairman on Generation	F. N. Becker, Jeddo-Highland C. Co.	C. H. Matthews, Susquehanna Coll. Co.
Sub-Chairman on Substations	W. C. Shunk, Cons. Engr., Bluefield	Carl Lee, Peabody Coal Company
Sub-Chairman on Distribution	M. W. Horgan, West Penn Pub. Ser.	C. W. Gibbs, Harwick Coal Company
General Chairman on *Mine Maintenance*	B. H. Stockett, Weston Dodson & Co.	F. F. Jorgenson, Consol. Coal Co.
Sub-Chairman on Roof Support	Reamy Joyce, Wood Preserving Co.	D. D. Dodge, W. J. Rainey, Inc.
Sub-Chairman on Ventilation	J. F. MacWilliams, Pa. C. & C. Corp.	W. J. Borries, Dawson-Daylight C. Co.
Sub-Chairman on Drainage	W. H. Lesser, J. H. Pierce & Co.	
General Chairman on *Mining Systems*	J. D. Rogers, Stonega Coke & C. Co.	C. J. Sandoe, W. Va. C. Co. of St. Louis
Sub-Chairman on Room and Pillar	F. G. Smith, Sunday Creek C. Co.	T. H. Clagett, Pocahontas C. & C. Co.
Sub-Chairman on Longface	P. C. Graney, C. C. B. Smokeless C.	G. A. Knox, Gunn-Quealy C. Co.
General Chairman on *Surface Preparation*	C. A. Gibbons, Susquehanna Coll. Co.	T. W. Guy, Cons. Engr., Charleston
Sub-Chairman on Screening	J. L. Osler, Blackwood C. & C. Co.	C. F. Hamilton, Binkley Coal Co.
Sub-Chairman on Cleaning	C. W. Connor, Nellis Coal Corp.	C. P. Proctor, Pittsburgh Coal Co.
Sub-Chairman on Dedusting	J. R. Fenton, J. K. Dering Co.	Carl Hayden, Sahara Coal Co.
General Chairman on *Safety*	R. H. Morris, Gauley Mtn. Coal Co.	G. B. Pryde, Union Pacific C. Co.
Sub-Chairman on Safe Practices	Wm. Crichton, Jr., Johnstown C. & C. Co.	J. F. Bryson, Harlan Co. C. Ops. Assn.
Sub-Chairman on Aid and Rescue		C. F. Keck, Jamison C. & C. Company

The committee membership under the above chairmen represents 160 coal mining companies, located according to the following general geographical divisions:

PENNSYLVANIA ANTHRACITE	7 companies
NORTHERN APPALACHIAN FIELD—Pennsylvania, Ohio, Maryland	40 companies
SOUTHERN APPALACHIAN FIELD—West Virginia, Virginia, Kentucky, Tennessee	60 companies
CENTRAL FIELD—Illinois, Indiana, Missouri	27 companies
SOUTHERN FIELD—Alabama, Arkansas, Oklahoma	9 companies
ROCKY MOUNTAIN FIELD—Colorado, Wyoming, Montana, Utah	17 companies
TOTAL	160 companies

A Cross-Section of

Coal Mine Methods and Equipment

By G. B. SOUTHWARD*

EVERY coal operator and engineer is often in the position of having to decide some method, type of equipment, or operating procedure on which his own knowledge and experience is not as complete as he would like to have it. If somewhere in the United States the same problem that he is confronted with has already been encountered and if he knew the resulting success or failure, such knowledge would be of invaluable benefit to him in forming the decision that he must make for his own company. Or again, as frequently happens, he may question or at least wish to know whether some phase of his own operation is being performed as efficiently as he can reasonably expect. If he could compare his own results with performances of other mines under similar conditions, he would have an indication as to whether an effort toward improving that phase of his own operation was apt to return a profit to his company. Or, to take a third contingency, perhaps he may have heard some report on a new method or type of equipment that appears to offer some merit for application at his own mine and he may be in some doubt as to whether the expense of a trip to see this reported operation would be justified.

To be in one or more of the situations above outlined is common to us all—repeatedly so—and it seems to be a useless waste to have to spend time, thought and money in trying to determine the proper course when the needed information already exists. If not all the information (for it seldom happens that two mining problems are similar in every respect) at least sufficient information does exist that would be of great help and value. But unfortunately such information is seldom available.

It is in recognition of this great need —as repeatedly expressed by forward thinking engineers and operating officials—that the Operators Committees of the Coal Division of the American Mining Congress were formed. Broadly speaking, the general purpose of this organization is to act as a central clearing house of information on all phases of coal mine engineering and operation and since such information is basically composed of actual experiences in mining it is of course obvious that there can be only one source where such data can originate. That is from the operating men themselves, representing the progressive companies of the coal mining industry. The personnel of the Committees of our Coal Division is made up of men of that type. At present, the membership is 201 committee members representing 160 coal companies and combined with them are representatives of manufacturing companies who make mining machinery and equipment.

The main purpose of this organization—to act as a central clearing house—is a rather ambitious program and some time will be required before it can be functioning completely so as to cover all phases and details of mining. So we recognize the fact that our work will have to start at the beginning and build up our information as we go, since there is no great amount of data already compiled that can be absorbed bodily. Therefore to start our program we first had to find out the general physical conditions, mining methods, types of equipment, and operating practices of the representative mines of the country.

To accomplish this, a questionnaire was sent during the later months of 1934 to the members of our committees and the results of the first replies—covering more than 100 mines—are given on the following pages. In presenting this data we wish to emphasize that it is not in itself held to be of great value—it was merely intended to indicate to our committee members the types of operations from which information can be obtained that will be the basis for the more detailed reports. However, this data is submitted here because it does have some slight interest as being a thoroughly typical cross-section of a group of our more progressive coal mines.

The data is presented in two forms. Table No. I is a summary of the types of equipment used, classified according to the different phases of mining that will each be covered by a special sub-committee. These sub-committees as shown on the organization plan are divided into the following main projects: (1) Face Preparatory, (2) Loading, (3) Transportation, (4) Power, (5) Mine Maintenance, (6) Mining Systems, (7) Surface Preparation, (8) Safety.

Table II is a preliminary analysis of some of the data shown in table one. This analysis classifies the equipment according to some of the physical conditions (seam heights, partings, dips, etc.) which are fixed by nature and are beyond the control of the operators to change. For example, the first horizontal column shows the number of mines using track cutting machines is 54—continuing across the horizontal column shows how these 54 mines are divided according to their seam conditions. This same procedure is followed throughout the page giving similar classifications. Again it is desired to emphasize that this analysis was compiled primarily to indicate to the sub-committees the class of conditions under which each principal type of mining equipment is being used in the group of operations covered by the first questionnaires received.

It will be noted that Table I covers 103 mines, while Table II includes 126 mines. This is due to the fact that there was an interval of two weeks in the preparation of these two tables and additional reports had been received in the meantime. It will also be noted that in many cases in both of these tables the number of mines shown in the different classifications do not add up to the correct total. This is because some items were not reported on some of the questionnaires received, and in other cases the same mine would report two different types of equipment for the same operation.

The data presented in these tables serves to bring out one important fact. That is, that information of a general nature cannot be particularly helpful in developing improved practices in coal mining. It may be of interest to know that one particular type of equipment or method of operation predominates for certain mining conditions, but in the final analysis it is the factors and the reasons behind outstanding performances that will be most helpful. We will, therefore, find that the greatest value to be gained from the committees of the Operators Section will be through detailed reports on individual methods and performances, and the present plan is to proceed along those lines, rather than toward gathering general statistics.

*Mining Engineer of the American Congress.

TABLE I—Preliminary Compilation of Surveys of Operating Methods

Physical Conditions

12 mines have seams less than 4 ft.
48 mines have seams between 4 and 6 ft.
43 mines have seams greater than 6 ft.
24 mines have seams with no partings.
50 mines have partings less than 5 percent of the coal.
29 mines have partings more than 10 percent of the coal.
21 mines have coal of soft structure.
44 mines have coal of medium structure.
38 mines have coal of hard structure.
75 mines have seams which dip less than 3 percent.
19 mines have seams which dip between 5 and 10 percent.
9 mines have seams with dips greater than 10 percent.

Mining Systems

1 mine uses long wall.
102 mines use the room and pillar system.
31 mines make no room pillar recovery.
8 mines make pillar recovery of less than 33 percent.
62 mines make pillar recovery of more than 67 percent.
19 mines recover pillars open-end.
46 mines recover pillars by crosscuts.
7 mines recover pillars by slabbing.

Face Preparatory

53 mines use short wall cutting machines.
28 mines use track mounted cutting machines.
19 mines use track mounted and short wall machines.
20 mines use vertical sheer cuts.
60 mines use electric coal drills.
40 mines use hand drills.
2 mines use compressed air coal drills.
31 mines use black powder.
62 mines use permissible powder.
4 mines use CO^2 or compressed air blasting.
40 mines sharpen cutting bits by hand.
60 mines sharpen cutting bits by machine.
8 mines use plated cutting bit points.

Loading

22 mines use all mechanized loading as follows:
9 mines use mobile mechanical loaders.
4 mines use face conveyors.
6 mines use pit car loaders.
3 mines use mechanical loaders and pit car loaders.
14 mines use mechanical loaders for a part of the output.
5 mines have mechanical loaders.
7 mines have face conveyors.
2 mines have pit car loaders.
66 mines use hand loading for entire output.
26 mines using hand loading have power drills for coal.
20 mines have rock brushing in entries.
7 mines load rock with mechanical loaders.
1 mine loads rock brushing on conveyors.

Transportation

33 mines have shaft openings with mine cars.
6 mines have shaft openings with skips.
22 mines have slope openings with mine cars.
4 mines have slope openings with conveyors.
40 mines have drift openings.
3 mines have outside incline with mine cars.
6 mines use smaller than 10-ton locomotives on main line.
70 mines use 10-ton or larger locomotives on main line.
11 mines use tandem.
64 mines have main haulage less than 2 miles.
35 mines have main haulage more than 2 miles.
17 mines have double track for at least one-half mile.
41 mines use outside rock or slag ballast on main line.
11 mines use steel ties on main line.
39 mines use wood preservative for main line ties.
48 mines have trip dispatcher on main line haulage.
30 mines have block signals on main line haulage.
72 mines use 60-lb. rail or heavier on main line.
80 mines use electric gathering locomotives.
27 mines have animal gathering.
3 mines use rope hoists for gathering.
57 mines use 40-lb. rail or heavier on gathering haulage.
31 mines use 30-lb. rail or heavier in rooms.
25 mines use all steel cars.
27 mines use combination steel and wood.

Roof Support

7 mines have strong top where no support is needed.
14 mines take down weak top, and no support is needed.
1 mine operating long wall uses cribs and pack walls.
84 mines support the top in entries and rooms.
21 mines use steel supports on long life entries.
4 mines use steel and brick on long life entries.
20 mines use steel and wood on long life entries.
16 mines use wood preservative on long life entries.
7 mines use steel on short life entries.
8 mines use steel and wood on short life entries.
66 mines have a serious cost item in their roof support.

Drainage

59 mines pump 100,000 gallons or less per day.
15 mines pump approximately 250,000 gallons per day.
7 mines pump approximately 500,000 gallons per day.
9 mines pump approximately 750,000 gallons per day.
14 mines pump more than 1,000,000 gallons per day.
22 mines use acid resistants.

Ventilation

49 mines are gaseous.
55 mines are non-gaseous.
16 mines use patented Methane detectors.
6 mines use blower and tubing to ventilate working faces.
45 mines use line brattices occasionally at working faces.
51 mines use tile or brick stoppings.
38 mines use concrete stoppings.
9 mines use automatic mine doors.
27 mines use 50,000 cu. ft. air or less per minute.
36 mines use 50,000 to 100,000 cu. ft. of air per minute.
15 mines use 100,000 to 150,000 cu. ft. of air per minute.
6 mines use 150,000 to 200,000 cu. ft. of air per minute.
10 mines use 200,000 or more cu. ft. of air per minute.

Power

104 mines use electricity for underground power.
77 mines use all purchased electric power.
20 mines have steam plants and generate all power used.
7 mines use both purchased and generated electric power.
20 mines have steam operated main hoist engines.
14 mines have steam operated main fans.
9 steam plants use refuse coal for fuel.
15 steam plants use coal screenings for fuel.
4 steam plants use R. O. M.
88 mines use 250-275 v. d.c. for all operations underground.
8 mines use 550 v.d.c. for all operations underground.
8 mines use 250 d.c. and 440 a.c. underground.
40 mines use compressed air for some machines as follows:
28 mines for drilling underground.
2 mines for main pumps.
7 mines in shops.
4 mines for tipple dumps or screens.
1 mine for slope hoisting engines.

Surface Preparation

13 tipples have stationary screens.
78 tipples have shaking screens.
22 tipples have vibrating screens.
22 tipples have no slate cleaning.
67 tipples have hand picking tables.
4 tipples have special daylight lamp over tables.
11 tipples use mechanical wet cleaning.
8 tipples use mechanical dry cleaning.
12 mines have magnetic iron remover.
2 mines have a mechanical slate picker.
41 mines have coal crushing.
10 tipples have mechanical dedusting.
2 tipples have chemical dedusting.

Safety

43 mines use open miners' lamps.
34 mines use closed miners' lamps.
22 mines use some permissible motors.
1 mine uses all permissible motors.
47 mines use rock dusting.
34 mines use sprinkling.
97 mines have safety inspection.
39 mines have safety meetings.
72 mines have part of men trained in first aid.
26 mines have 100 percent training.
51 mines have rewards for safety records.
58 mines have trained rescue teams.

TABLE II

Preliminary Analysis of Mining Methods and Equipment
Classifying Types of Equipment According to Seam Conditions

	Total Mines	Seam Hgt.—50"	Seam Hgt.+50"	Partings—10%	Partings+10%	Hard Coal	Soft Coal	Max. Dip—5%	Max. Dip+5%	Shaft Opening	Slope Opening	Drift Opening	Gaseous	Non Gaseous
Total Mines	126	19	96	90	25	43	75	82	29	43	26	51	51	63
Face Preparatory														
Track Cutting	54	6	49	43	11	22	31	38	11	22	10	22	26	28
Shortwall Cutting	81	18	63	60	20	27	52	57	15	26	18	33	37	44
Electric Drilling	63	11	52	51	12	25	36	41	20	31	11	22	31	32
Air Drilling	5	2	3	5	0	3	2	2	1	3	2	1	5	0
Hand Drilling Only	68	13	55	53	15	23	45	49	13	17	20	33	29	39
Powder Blasting	115	19	96	90	25	39	75	82	29	42	26	51	51	63
Air or Cardox	7	0	7	6	1	4	3	5	1	5	0	2	5	2
Loading														
Mechanical Loaders	17	0	17	13	4	5	12	12	5	10	3	4	7	10
Face Conveyors	6	1	5	5	1	3	3	1	4	2	3	1	3	3
Pitcar Loaders	6	0	6	6	0	4	2	3	3	6	0	0	1	5
Hand Loading Only	77	12	65	56	21	28	49	63	14	23	14	40	36	41
Mechanized and Hand	17	8	9	14	2	7	10	10	6	7	3	7	9	8
Haulage														
Main Steel Ties	12	2	10	..	..	..	..	11	1	9	0	3	6	6
Wood Preserved Ties	40	1	39	..	..	..	..	30	9	20	8	12	26	14
Rock Ballast	48	12	36	..	..	..	..	28	16	13	13	22	26	22
Locomotive Gathering	100	18	82	..	..	..	..	78	20	39	19	46	46	54
Animal Gathering	33	1	32	..	..	..	..	25	7	15	8	10	14	19
Steel Mine Cars	29	5	24	..	..	..	..	18	10	8	6	15	15	14
Composite Mine Cars	26	5	21	..	..	..	..	19	6	9	5	12	11	15
Wood Mine Cars	45	6	39	..	..	..	..	30	13	20	13	12	20	25
Mine Maintenance														
Permanent Timbering	36	5	31	..	..	..	..	24	9	17	5	17	21	15
Wood Preserved Timbering	9	3	6	..	..	..	..	6	3	5	2	3	6	3
Acid Resistant Timbering	25	5	20	..	..	..	..	19	5	15	5	8	20	5
Automatic Doors	17	6	11	..	..	..	..	7	8	4	4	9	9	8
Fan Tests	97	14	83	..	..	..	..	70	24	41	19	40	46	51
Power														
Power—Purchased	94	18	76	50	44	36	58	74	17	33	21	40	45	49
Power—Generated	23	3	20	17	6	5	18	11	12	8	7	8	9	14
Purchased & Generated	9	0	9	4	5	3	6	5	3	5	1	3	5	4
Mining System														
Low Pillar Recovery	47	5	42	34	13	14	33	34	9	25	11	11	23	24
High Pillar Recovery	79	15	64	63	16	30	49	57	20	23	19	40	35	44
Surface Preparation														
Hand Picking Only	83	14	69	65	18	32	51	61	18	32	14	37	40	43
Mechanical Cleaning	19	3	16	11	8	5	14	13	5	6	7	8	11	8
Mechanical Screens	112	18	94	87	25	43	69	81	27	43	24	47	53	59
Dedusting	15	2	13	13	2	5	10	14	1	7	3	5	9	6
Safety														
Closed Lights	72	8	64	51	20	28	43	51	20	33	19	22	49	23
Permissible Motors	26	9	17	22	4	5	21	21	5	14	5	7	18	8
Rock Dusting	54	5	49	46	8	21	32	39	13	28	16	9	42	12

THE COAL DIVISION of the Bureau of Mines has completed a mimeographed summary of the principal statistics of bituminous coal mining in 1933, based upon final reports from all operators. The following subjects are covered: Salient statistics; production by fields; methods of mining; stripping operations; "mechanized mining"; number and size of mines; relative rate of growth of coal, oil, and water power.

Statistics by counties for each of the following states: Alabama, Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Missouri, Montana, New Mexico, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wyoming.

Announcement of these figures has been made from time to time in the Weekly Coal Report, as fast as each table in the series was ready. A small stock of the tables has now been assembled in booklet form and will be furnished while the supply lasts without charge to subscribers and others receiving the Weekly Coal Report who have need for the data.

THE AMERICAN Society for Testing Materials has just published a compilation of all the standard and tentative specifications and tests for coal and coke. It is the first publication of its kind and has 108 pages of compact information. Five specifications, 13 methods of test and the standard definitions of terms relating to coal and coke are included. Copies of this publication can be obtained for $1 each from the A. S. T. M., 260 South Broad Street, Philadelphia, Pa. This collection of information is extremely worth while as a reliable and standard reference.

Rights to Sub-Surface Waters From Mining Operations†

By L. WARD BANNISTER*

THE mine operator has many problems connected with underground water. There is the problem, to which I address myself, of the right to take and use those waters in and about the mine. There are the problems of getting rid of them, too, when they are not wanted; of acquiring rights of way across intervening lands in order to discharge those drainage waters into some nearby stream; of the pollution of streams through the medium of tailings, and of waters impregnated with chemicals; of debris that is floated down the stream from mines and deposited on lands of others.

All of these are connected with underground water. My own particular subject is the right of the mine operator to use the waters found in the mine. We cannot answer that question without classifying underground waters. We find that our underground waters are divided into:

1. Underground streams.

2. Underground lakes or artesian belts.

3. Underground percolating waters. This last division, underground percolating waters, is divided into two kinds:

(a) Those that are tributary to a stream. In other words, which feed it.

(b) Those that are not tributary to the stream—the non-tributary percolating waters.

The mining operator may want to use the water for sundry purposes. He may want it for the boiler in his plant; to operate a concentrating table; for the domestic purposes. What is the law that governs or relates to the right of the mining operator to use these waters for these purposes, or any other purposes that occur to him in and about the mine?

I think, in order to understand clearly the law that relates to underground waters, we must also understand at least the fundamental principles of the law. The law of underground waters is a very refractory thing. Your case will depend upon the state in which your mine is situated. It will depend upon whether your rival water user is on the public domain or in private ground; upon whether you are in what is called an appropriation or priority state, or in what is called a riparian state, or in one of these hybrid states out here in the West.

Now, if we take up the law of surface streams, we find that in America there are three different bodies or systems of stream law:

1. There is what is called the riparian system.

This was imported into this country by Story and by Kent in the early part of the last century, and from France. The fundamental principle of this law, is that all land ownerships that are contiguous to the stream have a right to make a reasonable use of the waters of the stream. That does not mean that each land owner has a right to the same amount of water because his circumstances may differ from those of another land owner. But it does mean that every land owner is entitled to some water, a reasonable amount. There is no mathematical formula for the determination of how much a reasonable amount would yield. That is a general question which is left to the court or to the jury to decide.

2. Then we have in the states of the West, a different system which we call the Appropriation or the Priority system.

The fundamental principle of this body or system of law pertaining to streams is this: That he who is first in point of time to put the waters to use acquires the first right to as much of the water as is incident to his use as originally made by him; and that he who is second in time becomes second in legal rights; the third, becomes the third in legal right, and so on throughout the series.

Now, if there be a tail-ender in this series, and there is always one, and usually he makes a noise, the question of whether he gets any water or not depends upon whether, after subtracting from the natural flow of the stream, the amounts that belong to the appropriators who are older than he, there is anything left for him.

Such is the system, in brief, of appropriation or priority which prevails exclusively in seven states of the West—Arizona, Colorado, Wyoming, Nevada, Idaho, Utah, and New Mexico. I sometimes like to refer to these as the "sacred seven" because they contain no traits of the old riparian law.

3. Then we have, also in the West, 10 states that represent the third system of water law, the hybrid system.

This is a system of water law that under certain conditions applies the old riparian doctrine, and under other conditions applies the newer appropriation or priority principles.

Those 10 states are California, Oregon, Washington, the two Dakotas, Montana, Texas, Kansas, Nebraska, Oklahoma.

Now, under that hybrid system, if a controversy arises between two water users whose lands are contiguous to the same surface stream, then the dispute between them is decided in accordance with the old riparian principle. In other words, each one has a right to make a reasonable use of the water of that stream regardless of the date of the origination of his use, and the use will be confined to land ownerships that are contiguous.

If the controversy, on the other hand, is between two who claim as appropriators, and that means not as private land owners—their appropriations must be made at points of diversion on the public or Government domain of the United States—if the controversy is between those two, then that appropriator whose use is the older in point of time is the one who obtains the prior right. The doctrine of priority is applied as between them.

Then, if you have the controversy between one who claims just as a contiguous land owner along the stream, and one who claims as an appropriator with his point of diversion on the public domain, which of those two gets the water? Generally speaking, the one of the two gets the water who is prior in point of time, upon the theory that both of them really are the grantees of the Federal Government; the one by his appropriation, the other by the grant of riparian land. In determining the date of the owner of the contiguous or riparian land, you take the date when the land first passed from the Government into private ownership. In fixing the date of the rival appropriation, you take that of the use of the water. Whichever of the two, riparian or appropriator, is first gets the water as against

* Counsellor-at-Law, Denver, Colo.

† Presented September 25 to the Western Division Meeting, American Mining Congress, San Francisco, Calif.

the other, since each claims the water as a grantee of the Government.

There, you have the fundamentals of the system of water law as applied to streams. With that explanatory approach we may take up our immediate subject of underground waters.

The first body of water that we shall attack will be that of underground streams, because we do have underground waters in that form.

The law of the underground streams, if a mine operator encounters them, and his rival also encounters them, is the same as the law in respect to surface streams. It will depend upon whether you are in one of the old riparian states in the East, or whether you are in a simon pure appropriation state of the West, or in a hybrid state of the West. Wherever you are you treat the underground stream just as you would a surface stream.

Then we approach the next body of underground water, which is that of the artesian belt or underground lake—those bodies of water that fill the interstices between the particles of soil and rock and are held by confining sides.

Operators do not often encounter, in the course of underground operations, an artesian belt.

The rights of those who take water from that belt, again, depend upon in what state you are. If you are in one of those "sacred seven," then, under the leadership of Idaho, through its two decisions of Bower vs. Moorman, and Hinton vs. Little, those who take from that kind of a body of water, take under the priority principle, and the first user from that body is not to be interfered with by the second user, or the second by the third. If you were to come over into one of these hybrid states like California, put it out on Government land, and put all of the users of water on Government land, then they would share that water in accordance with the principle of appropriation or priority. But if on the other land, and still within the state of California, you have that body of water where there is only private land, and where there have been no uses until after the title of the Government has passed on the private lands, then a different principle will be applied—no longer the principle of priority or appropriation that we find in our sacred seven states or in the hybrid states of public domain—but rather you will have the principle of riparianism. In other words, each overlying land owner will have a right, regardless of the date of the origination of his use, to make a reasonable use of the waters of that common source of supply.

Now, as to tributary waters. What would you do with a stream and with percolating waters that ultimately, as vagrant, wandering drops, reach that stream, and in a situation where you will have some water takers on the stream proper and some at points where the percolating waters are to be found? What kind of a law would you establish as to that physical situation?

I imagine that you would reason it

L. WARD BANNISTER

this way: You would say that since nature treats the stream and the percolating waters that feed it as one physical unit, you, in your wisdom, as a lawgiver, would treat them as a legal unit; and that you would rate all water users, whether their points of interception are on the stream proper, or on the percolating waters proper, as being users from the same source of supply, and that they should be governed by the same rule of law, whether that rule be the appropriation system of the seven western states, or the riparian system of the eastern states, or the hybrid system out here of 10 states of the West of which I have spoken. That, to me, sounds like excellent reasoning. It would be the ideal way of handling it and, to a large extent, the law of these states does handle it that way, and yet not fully, as I shall show you.

If you were to go to the riparian states, or go to the hybrid states, when you have a stream and percolating waters feeding it in privately owned ground you would find that the principle of the law that would be applied would be our old friend, the riparian or corelative right system, or whatever you want to call it. In other words, all contiguous ownerships would be given the right to use some of the water and regardless of dates of use.

If you were to walk over into my state of Colorado, or New Mexico, or Wyoming, you would find that both kinds of water being physically connected, they would be as legally connected, and that rights of use would be regulated, no matter where the points of invasion might occur, by the principle of priority.

I am sorry I cannot say as much for the state of Arizona and the state of Utah. Yet, they belong to that same "sacred seven."

If you were to walk over with me today into the state of Arizona you would be told that percolating waters that are tributary to a stream are treated as part of the stream on one condition: namely, that the waters shall be found immediately under the bed of the surface stream or very close to it. If, on the other hand, they are found at a remote distance—and just what remote means I do not know, but let us say five miles, and that surely would be remote—then, even though they be known to be tributary to that stream, they are not treated as part of it, but may be owned and taken by the owner of the land in which they are found. He need not yield them up even to a prior appropriator on the stream that those vagrant, wandering drops feed.

If we were to go over into the state of Utah we find much the same situation. In the recent Consolidated Silver Company case, to which Mr. Ferry called my attention, we find that there, if the tributary waters at the point of interception are a substantial distance away from the stream which they feed, still they may be held by the mining operator for use in and about his mine, even though there be prior appropriators on the stream which they feed.

That may not measure up quite to the ideal which you have formed in your mind, or which I have formed in my mind, as to how those waters should be treated, but that is the law of Utah, that is the law of Arizona. I think that Mr. Ferry ought to be complimented on the selection of the attorneys who succeeded in establishing the point that was established by them in the case to which I have referred.

When we come to percolating waters that do not feed a stream, those that are disconnected, and where you have two or more rival users from them, what are you going to do with those waters?

In the old riparian states, and in these hybrid states of the west, and as established by the state of California in the Coachella case of 1931, I think it was, the holding is that where those waters occur in privately owned ground then each land owner has a right to a reasonable share of those waters for use on his land; but if, in those same states the water is situated out on the public domain and water users intercept it there, then they divide up the water in accordance with this principle of appropriation or priority.

Now, if you wish to go over into a simon pure appropriation state with that little body of water, what would happen to you? Well, in some of those states, probably about half of them, you would find that since that body of water is one body, and there are different users from it, and that the use at one point, let us say a well, affects the water level in another well, you would find the whole body of water, being physically a unit, would be treated as a unit legally and the water would be taken out under the principle of priority or appropriation. That is the way in which, I think, it ought to be taken out. But my will does

(*Concluded on page* 50)

Diamond Drill Practice On The Mother-Lode†

By MAYER G. HANSEN*

THE OBJECTS of diamond drilling are manifold and include:

1. Mineral prospecting.
2. Outlining known ore bodies.
3. Blocking out ore reserves.
4. Guiding mine development and workings.
5. General geological information.
6. Ventilation.
7. Drainage.
8. Conduits.
9. Fire fighting.
10. Special mill test samples.

Holes may be drilled with the same amount of ease from both surface and underground locations.

In the choice of stations or bearings, it is best to drill as nearly normal to the strike of the formations as possible. Holes drilled less than forty-five degrees to the strike may miss the ore shoots entirely. It has been demonstrated that it is well worth while to take the additional cost of cutting a new station, rather than apparently save the cost by drilling a fan of holes from one station and then miss the ore body completely.

Method

Drilling is done on either company account or by contract. Under the former method the driller may be paid a given rate per day or a given wage rate plus bonus, based on costs. The bonus system, where carefully worked up and honestly adhered to, is the best by far of all methods. Contracts may be based on footage drilled or on a cost-plus basis. Unless a small footage is wanted contracting is undesirable at a mine where the sample obtained and core recovery is paramount. On the other hand it is not economical to buy a drill when less than 5,000 feet is planned.

Organization

The personnel should be carefully selected and in organizations where two or more setters are required there should be a diamond drill foreman. When two or three runners constitute the drill crew, the setter should also be the foreman. If only one machine is in use, even on two shifts, it is more economical to use bits set on the outside by diamond drill concerns and have the runners directly under the mine superintendent.

It is desirable to train the runners, starting first as helpers, provided a diamond drill foreman is in charge. In small organizations it is considered best to obtain experienced runners even though it may be necessary to pay them a dollar a day more than miners and timbermen, because a great deal more responsibility rests with them. Not only does the cost of the bit and the daily chance of breaking it exist, but the additional footage the experienced runner can obtain together with a saving in carbon cost, quickly reduces the total cost per foot. In other words it is the cost per foot and not the cost per day that one must watch.

MAYER G. HANSEN

Equipment

The cost of diamond drill machines varies as greatly as the depth to which they can drill. For the purpose of this discussion the short hole machine will be classed as from 100 to 400 feet and cost approximately $800. The medium depth hole machine runs from 400 to 1,200 feet and costs an average of $2,000. The deep-hole machines may run up to $5,000. All figures are for the bare drill with drill rods, corebarrels, pumps, wrenches, couplings, water swivels and other equipment as accessory charges. The latter for medium to short holes costs approximately $1,000 or $1,200, and for the deeper holes one should add about $1.25 per foot to the depth desired.

Diamond drills have either hydraulic or screw feed swivel heads. Most are air driven through gasoline or electric motors may be purchased for practically no additional charge. Air drills are most efficiently operated at 90 pounds pressure.

The larger types of machines have a life of in excess of 50,000 feet and though I have not seen accurate figures for the lighter machines I would guess their life to be in excess of 25,000 feet if given proper care.

All types of machines are so arranged as to permit drilling at any angle from horizontal to vertically up and vertically down.

Pumps are practically considered standard equipment since greater efficiency is obtained with good uniform pressure of approximately 200 pounds. Duplex pumps, size 4½ x 3¾ x 4 inches, are preferred. They require only a small space and weigh about 200 pounds. The pumps are also used for cementing. It is well to insert a cylinder in the water end which not only increases the pressure, but also permits of rapid and cheap repairing when the cylinders become worn.

Much of the accessory equipment such as bits, reaming shells, gears, chuck jaws and rods can be purchased from steel companies or tube mills and made up in the company's own shop. By so doing considerable economies can be effected.

Diamonds

The choice between black carbon and borts varies with individuals, but it may be safely stated that the use of borts effects a definite saving even if used in conjunction with carbon.

In either case it pays to select the stones with great care, giving each an individual examination, and choosing the best grade possible. Good carbon ranges from $20 to $150 per karat, depending upon the sizes desired. Borts vary from $4 to $10.

* Field Geologist, Anglo American Mining Corp., Ltd., Randsburg, Calif.

† Presented Sept. 26 to the Western Division Meeting, American Mining Congress, San Francisco, Calif.

Black carbon is selected according to specific gravity, texture, appearance, shape and to a lesser extent the color of the stones. "Naturals," or rounded and tested stones, are avoided as a rule, chiefly because their texture is hidden from examination and also because sharp, angular stones with good cutting edges are required to cut the harder rocks.

The average choice as to specific gravity is between 3.20 and 3.35, although others are not entirely excluded. In general low gravity carbons are soft and high gravity carbons are hard.

The smooth, natural surface of a stone is generally referred to as the skin. It is of greater density than the inside or matrix of the stone. Thus, when specific gravity is being determined and studied, the amount of skin must be taken into consideration for proper classification. The skin is usually harder and tougher than the matrix. Naturals, or unbroken stones should therefore be chosen with a relatively higher specific gravity.

Carbon, the texture of which is massive or very fine or close-grained, is preferable. All black diamonds are crystalline, but variations in crystallinity are great. Stones made up of crystals relatively large in two dimensions and small in the third have been observed. This type has abnormal losses due to the grains "flaking off" without wear. Occasionally stones having two or more distinctly different textures are found, and such stones have a decided plane of weakness at the junction of the differing textures. Slightly porous stones have weak walls surrounding the pores and are to be avoided, although they may wear as well as the massive ones. When lenticular pores line up one after the other the result is a plane of weakness.

By appearance is meant flaws or planes of weakness, along which a carbon may break. Examination with a pocket lens frequently reveals slight depressions which may be traced all around a stone making a closed or practically closed line. Such stones are regarded with suspicion. On other occasions small cracks are actually visible, along which the stone splits in two when subjected to pressure.

The best shape to choose is roughly that of an octohedron. As previously stated, smooth, rounded stones are avoided and stones having more angular shapes with cutting edges are chosen. There is a difference in opinion among drillers concerning this quality. Though there may be a slight increase in the wear of sharp stones, the loss is compensated for in the increased footage, thus saving in labor cost, since in diamond drilling the labor cost per foot exceeds, in general, the carbon cost. In hard rock sharp stones are decidedly better, while in soft rocks, the rounded stones have less wear and are preferable. Also in drilling broken ground rounded stones are better.

Bits should have up to 35 or 40 stones each, even in the "E" or "A" sizes. They should be run as long as they cut or until the metal of the bit is so worn as to threaten the pulling out of stones. Runners should be supplied with plenty of bits. Thirty to thirty-five feet is the average life.

Reaming shells or swelled couplings are set with three rows of diamonds, three diamonds to the row. Each successive row increases the clearance 1/64 inch. Reamers should last an average of 500 feet in normal ground.

As stated previously borts has made vast inroads in the carbon business during the past few years. Most drillers prefer the clear unbroken diamonds. They may be smooth and rounded or in perfect crystal form. Twinned crystals and any stones having a small corner or edge broken off are avoided, as well as those which when held to the light show a cloudy appearance, indicative of a flaw or crack. Although a tedious job each stone should be examined before selection. Borts may sometimes be reset three or four times before chipping or breaking.

Occasionally borts bits will not keep up gage. In this type of ground a combination bit may be necessary, that is, one using black carbon for gage and the borts for cutting stones in the crown.

At the present time there are several firms in the business of furnishing "Readyset Bits." They may be made according to specifications or left entirely to the judgment of the companies, who will vary the type until a satisfactory bit results. They sell for between $50 and $100 including setting charges. After a bit has run out its usefulness it is sent back for resetting and a credit is received for stones returned in good condition. All broken stones are credited at scrap prices. Reaming shells cost approximately $25. The advantage of buying these bits are: that no carbon stocks need be maintained, and that for a one or two-shift operation a setter is also obviated where there is not sufficient setting to be done to keep him busy.

Operations

Hydraulic machines are preferred to the screw feed type, the advantages being: first, its flexibility by means of which the rate of advance is varied according to the rock being drilled; second, the bit is cushioned; third, requires less upkeep and repair. The advantages of the screw feed machine are: first, the runner is immediately apprised of changes in ground; second, it cuts hard rock better than hydraulic machines. Its disadvantages are: a reduction in drill speed is necessary in drilling non-uniform ground and that it requires greater upkeep and repair charges.

In general for drilling soft ground it has been found best to reduce the revolutions per minute and increase the pressure and rate of advance. Care should be taken to see that there is sufficient water pressure and enough water grooves in the bit to remove the cuttings as quickly as they are formed, to prevent the possibility of "mudding in." In drilling ordinary uniform ground the limits of pressure and revolutions per minute of the machine are determined by the sound of the motor and the "feel" of the rods, that is, if the motor turns over erratically and labors or is jerky, too much pressure is being used.

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(Approximate cost of each.)

VI. *Diamonds*
1. Black carbon.
2. Borts.
3. Readyset bits.

VII. *Operation*
1. Hydraulic machines.
2. Screw feed machines.
3. Drilling procedure.
4. Cementing and casing.
5. Cost of drilling.

VIII. *Special Features*
Trouble

IX. *Deflection of Holes*

X. *Geological Notes and Sampling*

Vibration is determined by feeling the rods ahead of the chuck with the hand. Variation in the rate of advance will reduce vibration.

In extremely hard ground best results are secured by reversing the drilling procedure for soft ground, that is, by increasing the revolutions per minute and decreasing the rate of advance and pressure.

Screw feed machines may usually be operated in the 300 gear which gives an advance of about seven feet per hour.

Thought should be given in the supervision of the drills to eliminate lost time. Even at best about 25 percent of a drillers' time is lost due to delays.

For overcoming troubles in drilling incident to caving, broken or sandy ground cementing is resorted to almost exclusively. In cementing down holes, a thin mixture of neat cement (usually three parts of water to one part cement) is pumped in under pressure. A stuffing box is cemented into the hole at the collar and threaded to make a tight connection. If the ground is caving the cement is introduced through the rods, keeping the bottom end well above the top of the cement to avoid the possibility of "cementing in" the rods. When the hole is filled with cement, the pump is connected directly to the stuffing box and from 300 to 400 pounds pressure applied. This seals up the rocks for a considerable distance from the hole.

Should another cave follow the above after only one shift of drilling, one of two methods is usually adopted: The first is to pour in cement, lower the rods, and wash the walls of the cemented portion of the hole with clear water until within about 10 feet of the bottom of the previously cemented portion. The water thus used in washing generally has sufficient head to force the cement into the country rock. The second method is to drop cartridges of cement into the hole until a quantity of cement has been introduced sufficient to cover the caved portion. The rods with the bottom end plugged are then lowered into the hole, smashing up the cartridges and forcing the cement into the walls.

In drilling short, flat holes through sandy, broken fault zones, it has been found more satisfactory to cement with cartridges than with a pump, since it frequently happens that the pump continues to wash the loose sand without permitting the cement to catch hold and seal up the cave. The cartridges are made of heavy paper similar to the cartridges used for tamping powder in blast holes. From two to four cartridges are pushed down at one time, depending upon the condition of the hole prior to the time of the cave. A maximum of 10 cartridges have been pushed down at one time. The efficiency of this method depends upon the depths of hole and other conditions; about 500 feet is the maximum depth at which it can be used on account of the abrasive effect of the rock on the paper shells.

The quantity of cement used depends to a great extent upon the degree to which the ground is broken up or caved. Generally about twice as much cement is used as the computed theoretical volume of the hole; occasionally, however, ten times more than the computed volume is necessary.

An effort should be made to time the drilling of cement so as to pierce it just after the initial set has taken place but before it hardens. This permits the soft, unhardened cement to run out or be quickly washed out leaving only a shell of cement on the sides of the hole—which is all that is desired. Of course if the ground is badly caved the cement should be allowed to harden about 24 hours.

Both Portland cement and Lumnite quick-setting cement should be used. The best combination can be determined by experimentation. If the cement is allowed to harden in soft ground there is a good chance that the drill will deviate from the course of the hole. Quick-setting cement is generally used in sandy, loose or talcy ground.

Casing should be used only when it is impossible to cement.

A single figure on cost is of course impossible to give. But in general for the short hole drilling in normal ground the costs should range between $1.25 and $1.50. The items included are labor, carbon, liability insurance, power, water, supplies, repairs and replacements, and station cutting.

Troubles are always expected and it is wise to have a set of fishing tools always on the job. More often than not, if the recovery of a string of rods or a lost bit can be undertaken immediately, it can be recovered.

Stones pulled from a bit can often be recovered by cutting a reaming shell in two, drilling additional and enlarging the water holes to approximately the size of the lost stone. These holes are filled with grease or wax and the shell with rods are lowered into the hole, run in and out, rotating constantly until the diamond finally lodges in one of the holes and is thus recovered.

Nearly all holes over 200 feet in depth deviate from the planned or desired bearing. An important hole should be surveyed before starting development work, based on its results.

If a long hole encountered ore and a check hole would be desirable, the original may be deliberately deflected by inserting a wedge in the hole. It usually is placed about 100 to 150 feet ahead of the ore.

It is always well to have the core examined and notes kept for each hole. With this record the core recovery should also be kept. Sludges are often important to catch as even in 100 percent core recovery in drilling the sludge represents twice as much rock area. The separate assays of core and sludge should be combined for a true assay of the ground cut.

Serving the Mining Industry Through the U. S. Bureau of Mines

(*Continued from page* 15)

output with the world's desire to consume. We must get the figures on that so we can settle down to a proper basis.

I look at it as one of the important functions of the Bureau to compare the trends of production and the trends of consumption. One of the ideas I have in mind to bring about soon is to give you, probably monthly, estimates of those trends for 30 days ahead, perhaps for slightly longer periods, so that business can possibly have something upon which to readjust itself. That work cannot be local work. It cannot be even restricted to national figures because it is an international subject. The career of any metal over a year's time has a very important economic, international factor in it. We have to consider what is going on over in other countries and why some of them can produce so cheaply. Occasionally we learn from them some process that is very important. Once in a while we find they have methods a little better than ours that we have overlooked.

The industry as a whole cannot do these things. Mining operators are not given to passing their confidential figures over to each other and getting around the table and thrashing them out. But they do, under the confidential relations that have been established freely give to the Bureau those figures to be merged in general results which will be of value in these economic studies.

We also have established a very complete arrangement for interchange of information of that nature with foreign governments. So you see we are ready to build up an economic picture.

I believe we can supply, in that way, a foundation of fact upon which mining men can construct their own conclusions, so they can see the obvious and necessary cooperation called for among themselves. At least, we might help them to regulate their own affairs, lay their own plans, and when they are in position to do that, and ready to do that, I feel reasonably sure that the government will be very well satisfied to see them do it and run their own business.

So far as I know the details of the Bureau's activities at the present time, and so far as I can see into the future, I shall be glad to answer any questions.

In the meantime I wish to assure you that so far as it lies in me I shall give the best I can to service of the mining industry through the Bureau of Mines. I crave your friendship and your support.

Diamond Drill Practice at the Bunker Hill and Sullivan Mining and Concentrating Company

By U. E. BROWN*

AT THE Bunker Hill and Sullivan mines at Kellogg, Idaho, Diamond Drills are employed mainly to test ground in the vicinity of known ore-bodies, to explore ground adjacent to known geological features, and to determine the character of unexplored areas. Occasionally drilling is done to prove extensions of known ore-bodies.

The Algonkian quartzite beds of this area are steeply tilted and severely faulted. While fairly hard and in places quite abrasive, the rock can be drilled with reasonable speed and carbon consumption if sheared and faulted zones are not penetrated. In these sheared and faulted zones, difficulties increase in proportion to the severity of the disturbance. The Bureau of Mines [1] states, "The most difficult material to drill with a diamond bit is hard broken rock, such as fractured and fissured quartzite. The bit runs jerkily in such a formation and tends to catch and then tear loose. The engine also varies in speed, laboring one moment, then speeding up and possibly slowing down again the next. Fissures often allow return water to escape, so that it never reaches the surface. In consequence the operator has difficulty in determining the proper way of handling the machine. The danger of losing diamonds is greatest and diamond wear is also highest in fractured or fissured hard formations than in any other class of material." It would be impossible to better describe drilling conditions in the sheared and faulted zones in the Bunker Hill and Sullivan.

They are the result of caving or partial caving of the hole. Small pieces of quartzite fall into the hole. If the rods are down this will act as a break on the string causing loss of power, jerky action and excessive wear. If pieces fall into the hole while the rods are withdrawn, the wear will be on the bit and the same action will result. If the piece or pieces are small, they will soon grind up and come out with the sludge, but the bit will be damaged. Although all bits are case-hardened, metal will be eroded and probably diamonds lost. If the pieces of quartzite are of larger size, or the hole caves, the chopper bit must be used to clear the hole.

The difference of conditions is illustrated by the comparison of cost of two holes. Hole A was drilled in ground of average hardness but not sheared nor faulted. Hole B was a short hole drilled in a fault zone.

drift. The holes are started with a Jackhammer machine and 2¼" steel. A short piece of casing is used in the collar of the hole. High pressure water is used when available. If pressure water is not convenient a small air pump is set up and ditch water (always available) is forced into the hole. The machine drills a 1⅜" hole and delivers a ⅞" core.

A diamond setter is not employed. The bits are purchased. They are set with small "Fine Hard" stones. Each bit will carry approximately 40 stones. The carbon per bit varies from 6.40 kts.

Table A

	Footage	Labor	Bits	Shells	Air	Oil & Misc.	Total Cost	Cost Per Foot
A	227	$96.00	$ 89.28	$5.39	$24.33	$13.44	$228.45	$1.0064
B	24	37.50	129.65	2.77	8.28	2.75	180.95	7.5395

Formerly it was the practice to have drilling done by some drilling contractor. The holes to be drilled and their objectives were determined by Mr. S. A. Easton, President of the B. H. & S. M. & C. Co., Mr. O. H. Hershey, Geologist, and Mr. Wm. McDougall, superintendent. This contract work was not always satisfactory. Various reasons contributing. The cost was not less than $2.50 per foot.

In 1931 the Company purchased a light Mitchell Diamond Drill. This machine is small and can be operated by one man on flat holes. The drill and engine are mounted on an air-drill column for work in the mine. For holes on the surface a small gasoline engine furnishes power. An operator was secured, who, when not drilling, is given other work in the mine.

Drilling is not continuous but when any ground is to be explored or the geology tested or proven the equipment is available and drilling can be started within 24 hours.

For moving and setting up the operator is given a helper. A helper is also necessary when drilling inclined holes. The machine can be operated in a 7′ x 7′

to 8.75 kts. The average weight is about 7.40 kts. The bits cost $7.50 per carat plus $7.90 for setting and blank. Shells cost $7.50 per carat plus $4.00 for setting and blank. Salvage carbon is sold to the setter for $7.50 per carat. Scrap carbon for $.80 per carat.

The bits are used regardless of weight or the character of the rock to be drilled. Information is thus being collected and studies carried on relative to the proper weight of carbon most suitable for bits to be used in the Bunker Hill and Sullivan. While no definite figure has as yet been determined, the work to date indicates that the variation in carbon weight should be 7.20 carats to 7.80 carats. Table B shows a comparison between bits carrying various weights of carbon.

The figures from which this table was derived show that 145 bits used carried 1065.68 kts. with an average weight of 7.35 kts. The loss was 220.2717 kts. or 20.669 percent.

It is believed that as additional information is gathered it will be possible to specify, with allowable variations, the weight of carbon each bit should carry.

* Chief Engineer.

1 Bureau of Mines Bulletin 243 "Diamond Drilling."

Table B

Bits	Ave. Footage Per Bit	Ave. Wt. Kts.	Total Carbon	Carbon Loss	% Loss	Kts. Loss Per Foot	Carbon Cost Per Foot in Dollars
10 (1)	14.6	6.233	62.33	18.6107	29.85	.1275	.95625
9 (2)	15.0	6.665	59.99	20.9207	34.87	.155	1.1625
22 (3)	19.45	6.904	151.89	34.6724	22.83	.08101	.6076
11 (4)	21.27	7.289	80.18	13.9540	17.40	.05963	.4472
14 (5)	21.43	7.480	104.74	19.4623	18.58	.06487	.4865
16 (6)	20.69	7.872	125.95	21.102	16.75	.06375	.4781
(1)	Weights of carbon		6.00 kts.	—6.40 kts.			
(2)	" " "		6.61 "	—6.80 "			
(3)	" " "		6.81 "	—7.00 "			
(4)	" " "		7.21 "	—7.40 "			
(5)	" " "		7.41 "	—7.60 "			
(6)	" " "		7.81 "	—8.00 "			

Table C

Footage	Labor	Bits	Shells	Air, Oil & Misc.	Total Cost	Cost Per Foot
625	$218.24	$449.38	$38.22	$42.24	$748.75	$1.198
Per foot	.3491	.7190	.0626	.0676		1.198

Table D shows the costs of drilling 4088 feet in the Bunker Hill and Sullivan Mine.

Table D

Footage	Labor	Bits	Shells	Air	Oil & Misc.	Total Cost	Cost Per Foot
4088	$1,896.70	$3,781.89	$388.39	$395.00	$367.89	$6,829.88	$1.6707
Per foot	.464	.9251	.095	.0966	.8999		1.6707

It has not been necessary to bore any deep holes. Three hundred feet being the greatest depth. The equipment is light and the character of the rock encountered would be the factor. The average depth of 35 holes has been 195 feet.

Some drilling has been done in outlying properties of the Company. At the Crescent Mine, nine short holes were drilled. This was in hard, abrasive quartzite with a small amount of fracturing. The cost are shown in Table C.

The cost of Diamond Drilling will increase with advancing prices of diamonds. During this year the price on carbon used in the Bunker Hill and Sullivan has advanced from $6.50 per carat to $7.50 per carat.

Cores are taken to the surface in a carrying case and placed in core boxes in a room set apart for storage and study of the drill cores. Cuttings are caught and a sample taken every five feet. The operator takes care of the cores and samples. This system has given better control and more satisfaction than it seemed possible to obtain from drilling contractors. A log of the hole is kept showing the run of the day, character of rock, any mineral showing and the cutting assay. The core is also present as a record of the hole. The cuttings do not give the actual grade of ore cut by the hole. It has been found that some of the lead and zinc sulphides remain in the hole. Samples taken from the hole after passing the ore will be salted but the core will show the width of the vein.

Drilling in this rock is of great value in the study of the geology. However, erractic and false results would be obtained in attempting to determine values and grade of ore from cuttings samples or the assay of the core.

MANAGEMENTS of Argonaut Mining Co., Central Eureka Mining Co., Original Amador Mines and Kennedy Mining & Milling Co., have ordered discontinuance of mine unwatering operations. No underground work has been done in the mines for nearly three months because of a strike, the companies refusing to recognize a newly formed union chapter in Jackson, Amador County, Calif., near where mines are located. About 10 days ago the managements announced intention to abandon mines unless workers returned to jobs by December 17. The ultimatum was ignored by workers. Considerable damage will result from flooded mines, the amount depending upon how long flood conditions prevail. About 500 workers involved. The mines affected by the shut-down are among the oldest gold mines in the United States. They are all located on the famous Mother Lode of California. (Press dispatch)

LEWIS W. DOUGLAS, former Director of the United States Budget, has been elected a director of American Cyanamid Co., to fill the vacancy caused by the recent death of Whiteford R. Cole. Mr. Douglas has also been elected a vice president of the company.

BY AUTHORITY of the Executive Committee, notice is hereby given that the Twenty-Second Annual Meeting of the Colorado Mining Association will be held with the Colorado Chapter of the American Mining Congress in Denver, Colorado, January 14 and 15, 1935, convening Monday morning, January 14, at 10:00 a. m., in the Auditorium of the Continental Oil Building.

Each mining county in the state will be entitled to send five delegates, but in no case shall any county cast more than five votes if roll-call is demanded. The State Commissioner of Mines, the President of the School of Mines, the Chief Colorado representative of the U. S. Bureau of Mines and of the U. S. Geological Survey, shall be delegates at large, and entitled to one vote each.

County mining organizations affiliating with the State Association or Commercial organizations in counties where no such organizations exist, are urged to appoint delegates, and see that their county is properly represented at the convention.

Delegates should be selected not later than January 5, and the list, together with the designation of a member to represent the county on the Board of Directors of the State Association, should be forwarded to the undersigned Secretary at Denver, promptly.

Dated at Denver, Colorado, this 12th day of December, 1934.

JESSE F. MCDONALD, *President*,
Colorado Mining Association.
ROBERT S. PALMER, *Secretary*,
402 State Office Bldg., Denver.

ALASKA JUNEAU GOLD MINING Co., during November hoisted from the lower level of the mine a moderate tonnage of higher value ore. As a result, the average value of the ore mined and milled was $1.0747 a ton compared with 94.11 cents a ton in October. And 11,345 fine ounces of gold were recovered against 10,280 ounces in October.

The company's costs are running higher, inasmuch as wages were increased during July to the highest level in the company's history. (News Dispatch)

EDWARD GRAFF, general manager, New River Company, was elected president of the New River Operators Association in annual meeting December 11, Mt. Hope, West Va. The Advisory Board of the Association is as follows: S. A. Scott, Mt. Hope, W. Va., and A. A. Liggett, vice president, Raleigh Coal & Coke Co. The Board is composed of R. H. Gross and William G. Caperton. Members of the executive committee are R. H. Morris, general manager, Gauley Mountain Coal Co., and Gilbert Smith.

Present-Day Diamond Core Drilling

By S. O. ANDROS*

THE DIAMOND core drill has been used as a prospecting instrument of precision by mining men for more than 60 years. Every country in the world in which mining operations are conducted has witnessed the probing finger of the diamond drill penetrating the unknown strata where mineral deposits were suspected. The solid cores of ore and rock obtained by these drills at depths ranging from 50 to 7,000 feet provide a visible and complete record of the formations penetrated.

Prior to the depression prospecting with the diamond core drill was diversified among all the metals—copper, tin, silver, iron, gold, but with the advent of the depression, prospecting with drills practically ceased and in 1932 diamond core drilling was confined to engineering projects. The search for new deposits of metal had been discontinued.

There have been many mediums of exchange in the world's history. Among the nomadic tribes cattle served the purpose excellently. Later, hides were used as an exchange medium and still later, pieces of stamped leather were tokens that hides were available on presentation of the tokens. Cowrie shells and wampum have served as money. Iron and silver have also acted as money but in recent generations gold has been the international monetary basis. Its price was pegged at $20.67 an ounce and so remained for many years. This price was not sufficient for any considerable new development by diamond core drilling until the revaluation to around $34 per ounce.

As soon as gold was revalued a campaign of core drilling was begun in every known gold-producing area. Marginal mines that could not be operated profitably under the old price of gold were reopened. Prospecting was undertaken all over the world and there are now a greater number of diamond core drills operating on gold than there ever have been before.

Any other commodity whose selling price was nearly doubled over night would have such an increased production that the price would very quickly revert to its old level. Curiously enough the production of gold has not materially increased to any such extent even under the stimulus of the revaluation at nearly twice its former price.

*E. M. Sullivan Machinery Co.

One Man Diamond Core Drill Operating Underground. Cores are shown in tray below machine

The principal areas now operating gold properties are Northern Ontario, Southwestern Quebec, Western Ontario, British Columbia, Western United States, Australia, the Philippine Island, Russia, Union of South Africa, West Coast Region of Africa, Mexico and all Central and South American countries.

The prospecting being done everywhere is chiefly being conducted by diamond core drills. There are, for example, in the neighborhood of 125 drills in Quebec, Ontario, and Africa alone.

The drills are largely used on the surface for new mines and for re-drilling old properties that had formerly been prospected and turned down but that are now minable since the gold revaluation.

About 60 per cent of the core drills now in use in gold territory are light gasoline engine driven drills, generally producing a core of 7/8 inch diameter. Drills in use underground are air and electric motor driven. In general the drilling is shallow.

Since the gold revaluation, prospecting has been carried on farther afield in the Canadian Northlands with great energy. As new indications are exposed by the individual prospector, the mining companies continue the exploration with diamond core drills. Many of the newly discovered fields are far distant from any means of transportation and the airplane has added to the romance of gold hunting. Planes are used for the transport of drills, supplies and crews. They cut down greatly on time required for getting the serious prospecting underway. Often the cost of transporting the equipment to the location exceeds the total cost of the equipment itself. Naturally, there arose a demand for as little weight as possible and as a result very light machines of the gas engine type have been developed.

With the increased use of drills it was only to be expected that a newer system of drilling would be developed. At many properties very short holes are drilled at frequent intervals and at various angles to determine the nature of the ground ahead and to intercept a lead or vein. For this purpose so-called one-man drills are used in great numbers in gold mines.

(*Concluded on page* 49)

Churn Drilling Practice In The Tri-State Zinc-Lead District

W. F. NETZEBAND*

THE TRI-STATE Zinc-Lead Mining District, sometimes called the Joplin-Miami District, is the largest zinc producing field in the United States and is an important producer of lead. It embraces an extensive area in Ottawa County, Oklahoma; Cherokee County, Kansas and adjacent portions of Missouri, mainly in Jasper County. The Oklahoma-Kansas portion of the district, in the vicinity of Picher, Oklahoma, has been the principal producing area since 1917, having yielded about half the 19 million tons of zinc and lead concentrates valued at some 827 million dollars, which the district has produced during its history since 1842.

The churn drilling practice as described in this paper has gone through a gradual evolution with the years and has been continually improved, both in the mechanical performance of the drill rig and in the technique of interpreting the results obtained.

History

In the early days of the district, prior to 1890, prospecting and mining were practically synonymous. To start mining one or two men would sink a shaft on a spot that appealed to them as being mineralized. Their hoisting equipment consisted of a hand windlass and a small tub or half-barrel. Mining was limited to about 50 feet, the level of the water, for these miners were not equipped to handle water in large quantities.

The year 1890 saw the first churn drill in the district. This was the springpole churn drill and was the forerunner of the modern churn drill. It consisted of a sapling with the butt anchored to the ground, a rope fastened to the other end and a fulcrum, usually a forked stick, placed about midway of the pole. The "string of tools" consisted of a 2 or 2½-inch steel bar with a chisel bit attached to the lower end of the rope. A wooden bar would be fastened at right angles to the rope and a man would take hold of each end of this bar to impart the churning action to the tools. The holes drilled were about 2½ or 3 inches in diameter and under extremely favorable conditions could be put down 60 to 70 feet. As this corresponded to the limit of mining at that time, it was found to be very satisfactory and much more economical than sinking a shaft, but even so its use was limited.

The next development in the evolution of the churn drill was the horse driven churn drill, fashioned after the horse whim. This was followed rather closely by the power-driven churn drill, for in 1899 the Keystone Driller Company introduced a steam-driven churn drill. This was a "two-piece rig," that is, the power and traction unit were separate from the jack or drilling unit. This development was soon followed by the installation of the power and traction unit on the drill jack so that the drill rig was self contained. With the rapid development of the gasoline engine the steam units were rapidly replaced by four-cylinder gasoline engines in the years following 1925.

Geology

For a better understanding of the problems encountered in churn drilling a knowledge of the geology of the district is essential. The geology has been so thoroughly covered in the recent articles by George M. Fowler and associates, published by the American Institute of Mining and Metallurgical Engineers,† that only a very brief resume will be given.

Most of the surface rocks of the Oklahoma-Kansas area are the Cherokee shales of Pennsylvanian age. To the east the progressively older Chester and Boone limestones and cherts of Mississippian age are exposed at the surface. Practically all of the ore has been taken from the Boone formation.

Mr. Fowler, after several years of field work, has been able to differentiate the beds of the Boone into several easily recognizable horizons, as shown in the accompanying stratigraphic section taken from Mr. Fowler's paper "Chertification in the Tri-State Mining District."

Based upon this study, Mr. Fowler has been able to work out the structure associated with ore deposition and has greatly simplified prospecting, especially in new areas.

The ore bodies are flat lying and occur either as large deposits of the blanket type or as narrow runs. There are several mineralized horizons, and under favorable conditions the ordinarily barren horizons between may also be mineralized.

Churn Drill Practice

Due to the type of deposit, the ore bodies of this district lend themselves rather readily to exploration from the surface by churn drills. To those unfamiliar with the geology of the district, it is always a surprise to learn that diamond drilling is not the usual method of exploration. Diamond drilling has been tried, but because of the many cavities and often large caverns, and the highly fractured condition of many of the chert areas, the diamond losses were so high that it was found to be an uneconomic method of exploration. The technique of churn drill practice has been developed to such a degree that comparatively accurate results can be obtained.

When the churn drill was first introduced into the older part of the district in the vicinity of Joplin, several holes scattered more or less promiscuously about a 40-acre tract were considered sufficient. With the discovery of the richer, deeper ore bodies in the Kansas-Oklahoma part of the district about 1915, it was found that closer and more systematic drilling was necessary before the investment of the larger sums of money required to sink shafts and unwater this territory. The prevalence of narrow runs cut down the percentage of holes drilled showing ore and required even closer spacing to define an ore body of this type.

Most of the more systematic drilling has used a plan whereby a row or series

* Mining Engineer, Tri-State Zinc & Lead Ore Producers Association.

† G. M. Fowler and J. P. Lyden: The Ore Deposits of the Tri-State District (Missouri-Kansas-Oklahoma). Trans. A. I. M. E. (1932), 102, 206-251.
G. M. Fowler, J. P. Lyden, F. E. Gregory, and W. M. Agar: Chertification in the Tri-State (Oklahoma-Kansas-Missouri) Mining District. Tech. Pub. No. 532-I. 45, A. I. M. E. (1934).

of rows of holes were drilled in an east-west direction. The spacing of the holes has depended on the size of the tract and the resources of the group doing the drilling. The most common spacing heretofore was on 100 or 200-foot centers with closer drilling when favorable indications were found. The east-west drilling was practiced because in the Joplin area most of the ore trends were either slightly east or west of north.

Later some companies made a practice of drilling a row of holes around the periphery of the tract and then drilling several cross sections if no favorable indications were found. It has almost invariably been the practice to abandon the systematic cross-section drilling and concentrate the drilling around an ore hole when one is found. In drilling around an ore hole, most companies space the holes about 50 feet apart, but if the drilling is in an area where the ore bodies are known to be narrow, many companies drill on 25-foot centers. One company adopted the system of drilling three holes in a hundred feet, using 33-foot centers.

Since Mr. Fowler has worked out the stratigraphy of the Boone formation and the relationship of the ore bodies to the structure, the spacing of the holes in new territory has been widened. The first drilling is done merely to determine the structure and close drilling confined to the favorable structure. On one large tract being drilled at present the initial holes are spaced one-quarter mile apart, while on another smaller tract these holes are drilled 880 feet apart through the center of the tract.

Prior to 1924, most of the holes were drilled 5⅞ inches in diameter, but since that time the size of the hole has been standardized at 6¼ inches. This larger size was brought into use because the deeper drilling required a heavier string of tools, and improvements in the drill rig made it possible to handle this heavier string as easily as the earlier rig handled the lighter string.

When drilling in an area where much fractured ground is expected and several strings of casing are necessary to obtain an accurate sample of the ore, the holes are started at either 8 or 10 inches and finished at 4⅞ inches if necessary. The drillers prefer not to use the 4⅞-inch tools unless absolutely necessary, both because they lack weight and are slow drilling, and because if bad ground is encountered, either the hole must be abandoned or the chance taken of losing the tools under caving ground.

Most of the drilling is done under contract at a given price per foot. In normal times the price was $1.00 per foot for ordinary drilling and $1.10 to $1.25 for drilling where several strings of casing were necessary. At the present time the price is about 85 cents per foot for ordinary drilling.

Many of the rigs are owned by the driller, but there were several contractors who own or have part interest in a number of rigs. Some contractors have had an interest in 15 or 20 rigs. During the boom years of 1925 and 1926 there were more than 400 rigs at work in the district. This dwindled to practically nothing in 1932, while at present there are about 25 rigs at work.

Table 1.—Stratigraphic Section, Boone Formation

Bed	Thickness, Ft.	Characteristics
B	0-40 (depending on erosion)	Light brown and gray limestone and dolomite, some white and light blue chert.
C	25-32	White and blue chert, brown and gray limestone and dolomite. Usually more dark blue chert in bottom 10 ft. of horizon. Fig. 3, showing limestone, cotton rock, and chert is from this horizon.
D	20-25	White cotton rock, some hard white chert, white and light brown limestone. Tripoli in this horizon where limestone has been leached. Contains commercial orebodies in a few mines.
E	5- 8	Gray and brown chert and white chert nodules. Brown limestone and dolomite. Important ore bed in some mines contains mostly galena.
F	12-15	Light brown limestone and white cotton rock. In areas of complete chertification is dense white and light gray chert.
G	10-12	Important ore horizon in many mines. Ore occurrences in this and H bed are generally similar, but this bed is more extensively mineralized. In some mines G and H beds both contain ore and are mined together. Figs. 2 and 6 show chert development in this bed.
H	13-15	G and H beds usually thin-bedded, alternating limestone and cherty bands 2 to 5 in. thick. In minable areas the ore bands are from ¼ to 2 in. thick and replaced similar thickness of limestone. The galena and sphalerite are usually banded with galena on top.
J	4- 5	Brownish and gray limestone and chert, or soft greenish limy stratum usually containing glauconite. Mineralized only in areas of intense deformation. Bottom of Warsaw formation.
K	8-12	Top of Keokuk formation. Important ore bed. Comprises rounded nodules 5 to 9 in. in diameter in upper part of bed with long, larger nodules in lower part. Ore generally confined to upper two-thirds of bed. Short Creek oolite, 5 to 8 ft. thick, occurs in this horizon in some areas. Oolite is found from top of K bed to bottom of L bed. Figs. 4, 5, 8, 9, 11, 12, and 13 show typical chert development in this bed.
L	26-30	Massive limestone, massive grayish chert or cotton rock. Contains ore in zones of intense deformation. In places contains 5 ft. stratum of oolite. Fig. 7 shows chert from this bed.
M	19-22	One of the most important ore beds of Oklahoma-Kansas area. Where metamorphosed, definite nodules 4 to 12 in. in diameter occur throughout bed. In many places large nodules (6 to 12 in. thick by 2 to 5 ft. in diameter) at bottom of bed. Ore-bearing part of this bed in different areas of Oklahoma-Kansas field varies in thickness from 5 to 22 ft. Bottom 12 ft. is most productive horizon. Figs. 10, 15, 15*a*-1 to *a*-9, 17, and 20 show chert from this bed. Fig. 10 shows bottom of this bed and top of N bed in the Southside mine.
N	20-25	Massive limestone, or mottled grayish chert with very few large (1 ft. thick by 5 to 15 ft. in diameter) nodules. Contains ore horizon 8 ft. thick near middle of bed in a few mines. Fig. 10 shows this bed chertified.
O*	8- 9	Important ore bed in a few mines. Round, flat nodules (2 to 4 in. by 3 to 6 ft.) embedded with cherty bands 1 to 4 in. thick. In some mines contains interbedded layers of nearly pure galena or sphalerite, or both, with galena above sphalerite, varying in thickness from a fraction of inch to several inches. These sheets of ore continuous in large areas. Such mineralization comprises "sheet ground" mines in old Missouri fields. Southern part of See-Sah mine, near Cardin, Okla., is in this bed and is in "sheet ground" formation.
P*	8-11	Large flat chert nodules interbedded in chert, generally barren, but in places mineralized with beds O, P, and Q, making ore horizon 30 to 38 ft. thick.
Q*	17-18	Limestone and chert, generally massive. Only relatively few churn-drill holes have reached depths greater than 50 ft. below Q bed.
R	55+	Top of Reeds Spring formation. Largely dense limestone, dolomite or gray and blue chert, with chert nodules.

* The Grand Falls chert horizon described by Smith and Siebenthal in U. S. Geological Atlas No. 148, *Joplin District Folio* (1907), is found only in or related to zones of deformation. In undisturbed areas it is limestone. It falls within the range of beds O, P, and Q. Smith and Siebenthal give it a thickness of 15 to 120 ft. and state that "it lies about 100 ft. below the Short Creek oolite." The Short Creek oolite is found sporadically from the top of K bed to the bottom of L bed, a vertical range of 40 ft.

Sampling

Until the last few years, not much attention was paid to the cuttings coming from the Cherokee and Chester shales. On the log these were usually lumped together, and any sandstones or limestones encountered were entirely overlooked. With the new knowledge that has been gained regarding the relationship of the ore bodies to the structure, the sandstones in the shale have become important markers, and more attention is paid to their position and character.

It has been the practice to collect samples from every 5 feet of the rock formations encountered. A flat-bottomed bucket with a flap valve is used and the hole thoroughly cleaned after each 5-foot "screw." The cuttings are dumped into a tub or half-barrel and a small sample panned by the driller. If any ore mineral is present, the cuttings are allowed to settle and the clear water decanted. The residue is dumped upon the ground and properly tagged as to depth, or holes are dug and the sample poured in, the surplus water draining into the ground. Care is taken not to lose any of the slimes, for the sphalerite and galena slime readily, and if the slimes were lost, the resulting assay would be inaccurate. If panning shows no ore mineral is present, the cuttings are washed and about 5 pounds placed out on the ground and tagged for later inspection by the company field man or geologist. While drilling in ore, samples are taken every, 2, 2½, or 3 feet instead of the usual 5 feet. A 2 or 2½-foot sample is accurate enough for valuation purposes and for determining the floor level when mining is started, as much of the ore is disseminated and its location varies within the ore horizon, and it is always necessary to mine a certain amount of barren material in either the stope or the heading.

In order to obtain correct depths when

in ore, the hole is usually checked with a steel tape, otherwise the driller takes his depths by measuring on the rope with a 5-foot stick.

When the hole is completed, the field man carefully pans all cuttings and makes up his log. Usually all cuttings which the field man thinks will run more than 2 percent sphalerite or 1 percent galena are taken in for assay. This practice varies among the different companies, some companies assaying all ore showings and others assaying only the better showings.

In writing the log in the field, the field men and drillers have developed a terminology to designate the amount of mineral present. The estimated assay varies with the several companies and, of course, the estimate varies with the man. All sphalerite is designated as "jack" and galena as "lead." The following table gives an idea of this terminology as used by one company.

Jack shines	1.0	to	2.0% ZnS
Fair jack shines.	2.0	to	3.5% ZnS
Good jack shines.	3.5	to	4.5% ZnS
Jack	4.5	to	6.0% ZnS
Fair jack	6.0	to	7.0% ZnS
Good jack	7.0	to	10.0% ZnS
Very good jack..	10.0	to	25.0% ZnS
Extra good jack..	Above		25.0% ZnS

For galena, about one-half the above assays are used, because until recently lead ore sold for approximately twice as much as the zinc ore. Prior to 1929, many engineers, in making valuations of properties, doubled the lead assay, added it to the zinc assay, and used the price of zinc concentrates to obtain the value of the combined lead and zinc ore.

Many of the holes drilled by the small companies and promotion groups have no assays made of the mineral values. In this case, when used for valuation purposes, the above values are modified by whatever information may be available regarding that particular property and the circumstances under which the holes were drilled.

Underground Drilling

Several of the larger companies in the district have built small rigs for use underground. These rigs are usually powered by electricity and are moved from place to place by mules or with snatch block attached to the mine pillars.

Horse-Driven Churn Drill

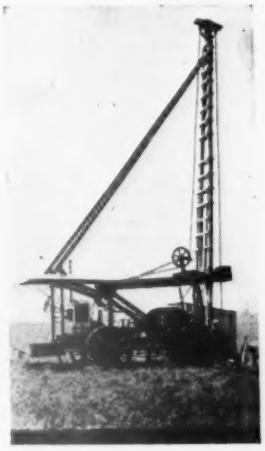
The height of the derrick is adjustable to fit the varying roof heights. This type of rig will drill about 100 feet at an average cost of about $1.25 per foot.

One company, in drilling "boulder" or "open ground," developed a stellited cross bit which was found very successful in maintaining a straight hole. Ordinarily in drilling this type of ground it is difficult to maintain a straight hole, due to the numerous cavities encountered.

Drilling Tailing Piles

Since 1925, many of the tailings piles are being rerun to recover mineral values which were not recoverable at the time the tailings were made. As the margin of profit is small, it is necessary to know fairly closely what values remain in the pile.

Various methods of sampling the piles are in vogue. Some cut trenches into the pile at various points, while others

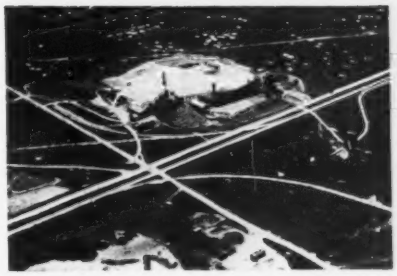


Typical Prospecting Drill

drill the pile with a 2-inch augur similar to the augur used in testing clay pits. To avoid salting the sample, a 2-inch pipe is kept ahead of the augur point. These two methods test only the upper surface of the pile, and as many of the piles are over 70 feet high, some other method was necessary to give a true picture of the values in the pile.

Several companies have solved this problem by the use of churn drills. One company used accessory equipment similar to that used in testing gold placers. Double strength casing with a heavy driving shoe on the bottom was driven into the pile and the bottom of the casing kept about 10 feet ahead of the tools. The tailings inside the casing were removed by a tool similar to the "horn socket" fishing tool. The tailings pack into the socket tight enough so that they can be removed from the hole. No water is used in drilling, and the slimes are recovered intact.

This method of sampling is about the most accurate in use and gives a true picture of the location of the values in the pile.



Typical Mining Property Near Picher

Acknowledgements

The author is greatly indebted to Mr. G. M. Fowler, consulting geologist, for the permission to use some of the data incorporated in his papers on the geology of the district and for information on some of the present day churn drill practice. Acknowledgment is also made of the valued assistance and helpful criticisms of Mr. M. D. Harbaugh, secretary of the Tri-State Zinc and Lead Ore Producers' Association.

A SHARP EXPANSION of activity in the superphosphate industry was largely responsible for a relatively marked increase in domestic shipments of phosphate rock in 1933. The year showed advances over 1932 of 33 percent in total mine production (2,309,269 long tons); 46 percent in total tonnage shipped (2,490,312 long tons); and 37 percent in total value of shipments ($7,872,362). In 1933 phosphate rock was produced and shipped in Florida, Idaho, Montana, Tennessee and Virginia.

Florida led all other states, as usual, in total shipments. Compared with 1932 marketed production in the state increased 45.3 percent in quantity and 34.3 percent in value, and the tonnage constituted 85.8 percent of the total domestic shipments. In 1932 Florida shipped 86.1 percent of the total. Tennessee ranked second in total output in 1933 and shipments increased more than 70 percent over 1932. Tennessee and Virginia shipped 34.1 percent of the total domestic shipments in 1933, compared with 11.3 percent in 1932.

Although total sales realizations of the producers were higher in 1933 the apparent increase in demand was not followed by a rise in prices. Total average prices, as reported by producers, for the different grades of rock sold were consistently lower. Trade quotations for the first 6 or 8 months of 1933 remained practically the same as in 1932. In the closing months of 1933 they declined. At this time, however, the price market was in some respects characterized by a stronger undertone due, in part, to agreements concluded between exporters in Florida and Morocco regarding foreign markets.

Total stocks in producer's hands December 31, 1933, showed a decline of about 12 percent, compared with 1932.

MINING EVENTS

Gold and Silver

THE HIGHER prices paid for domestic mine silver under the regulations and orders promulgated in December, 1933, had no effect on the production of silver before the end of the year, as only about 1,100 ounces of domestic silver received the benefit of the increased price. Also, while higher prices paid for gold from August to December stimulated development and added materially to profits of mine operators, they did not greatly increase the quantity of gold produced in 1933. There was actually a decrease in the quantity of domestic mine gold recovered in continental United States, but mines in the Philippine Islands had an increased yield of 80,742 ounces in 1933 and the output was four times as much as it was in 1924. These facts are brought out by the accompanying tables presenting condensed information published in more detail in the various State reports and in the gold and silver chapter (General Report) of *"Minerals Yearbook,* 1934."

About 7,000 mines contributed to the output of gold and silver in 1933; many were very small operations as 70 per cent of the entire yield of gold (Philippine Islands and Puerto Rico excluded) represented the output of 25 companies. The mine output of silver from the 25 leading producers was about 86 percent of the total silver and eight of the 25 had an output of more than 1,000,000 ounces each. Also, about 25 per cent of the domestic gold was derived from placers and of this nearly 70 per cent was recovered by 64 gold dredges; thus, nearly 3,700 other placer operations each yielded only an average of about 40 ounces of gold.

It is of interest to note that the combined total output of refined domestic gold as given by the Bureau of the Mint for the last 29 years shows the small excess of only 0.39 per cent gold and 0.67 per cent silver over the total mine output of gold in the United States, as stated by the Bureau of Mines.

For the first time in many years the quantity of copper ore (containing gold or silver) treated in 1933 was less than the quantity of dry and siliceous ore treated. The copper ore treated in 1929 was 62,140,800 tons as compared with only 8,363,600 tons in 1933, whereas the quantity of dry and siliceous ore treated increased more than 1,350,000 tons during the same period. One of the reasons why the gold production of the United States has not greatly increased is that the gold derived from copper ore has decreased more than 352,000 ounces since 1929. The great decrease in the quantity of base ores containing gold and silver treated in the United States is shown by the fact that in 1929 about 67,989,000 tons of base ores yielded 334,106 ounces of gold and 49,707,013 ounces of silver, while in 1933, 10,512,347 tons of base ores yielded 162,544 ounces of gold and 19,452,660 ounces of silver. The dry and siliceous ores yielded an average of 0.18 ounce of gold and 0.42 ounce of silver a ton in 1933, and 10,512,347 tons of base ores (containing gold and silver) yielded 0.015 ounce of gold and 1.85 ounces of silver. It is evident that with the mining of base ores at low ebb any large increase in the domestic mine output of gold must come from placers and from dry and siliceous ores. Furthermore, as there are only a few mines now operating at which silver is the important metal recovered, greatly increased silver output must await an expansion in the quantity of base ores treated.

ORE PRODUCED IN THE UNITED STATES AND AVERAGE RECOVERY OF GOLD AND SILVER PER TON IN 1933, BY STATES *

State	Dry and siliceous ore: Short tons	Dry and siliceous ore: Average recovery in fine ounces per ton: Gold	Dry and siliceous ore: Average recovery in fine ounces per ton: Silver	Copper ore: Short tons	Copper ore: Average recovery in fine ounces per ton: Gold	Copper ore: Average recovery in fine ounces per ton: Silver	Lead ore: Short tons	Lead ore: Average recovery in fine ounces per ton: Gold	Lead ore: Average recovery in fine ounces per ton: Silver
Alaska	4,171,000	0.053	0.03	.....	....	....	.....	....	....
Arizona	96,090	.257	1.41	888,508	0.053	2.38	11,029	0.251	12.67
California	1,281,843	.274	.28	38,176	.030	.13	1,257	.177	15.74
Colorado	741,900	.309	.89	91,133	.042	16.27	2,604	1.770	15.73
Idaho	131,187	.309	1.15	17	.737	4.71	630,305	.001	3.93
Michigan	200	.048	.07	† 328,000	....	.38	.....	....	....
Montana	167,237	.250	1.21	491,893	.009	3.28	7,425	.158	5.76
Nevada	448,984	.178	1.74	1,197,498	.010	.06	1,583	.458	21.23
New Mexico	38,650	.116	3.63	1,100,707	.001	.02	877	.028	4.47
Oregon	11,508	.470	1.60	.....	....	....	2	23.90	23.50
South Dakota	1,432,555	.357	.09	.....	....	....	.....	....	....
Texas	.....	....	....	45	....	1.40	18	....	5.39
Utah	150,007	.325	6.02	3,524,073	.010	.10	62,319	.056	18.61
Washington	5,275	.676	2.75	.....	....	....	230	.030	2.54
Wyoming	1,071	.342	.06	.....	....	....	.....	....	....
Eastern States	2,869	.248	.06	‡ 703,536	.001	.08	.....	....	....
Total	8,680,376	.180	.42	8,363,586	.013	.70	717,649	.019	5.47
Percentage	45.22	....	....	43.59	....	....	3.74	....	....
Total, 1932	8,226,167	.198	.48	11,504,946	.008	.45	697,168	.023	7.02
Percentage	38.35	....	....	53.63	....	....	3.25	....	....
Total, 1931	8,329,009	0.177	0.52	30,966,550	0.007	0.31	894,635	0.020	6.84
" 1930	7,767,289	.163	1.11	41,723,797	.008	.33	1,380,641	.019	6.36
" 1929	7,671,150	.140	1.45	62,140,835	.007	.29	1,592,043	.023	7.35

* Illinois, Missouri, Philippine Islands, and Puerto Rico excluded; quantity of crude ore containing gold and silver not known.
† Includes only copper ore that yielded silver.
‡ Includes pyritiferous magnetite from Pennsylvania yielding 2,158 tons of copper concentrates.

ORE PRODUCED IN THE UNITED STATES AND AVERAGE RECOVERY OF GOLD AND SILVER PER TON IN 1933, BY STATES *

State	Zinc ore: Short tons	Zinc ore: Average recovery in fine ounces per ton: Gold	Zinc ore: Average recovery in fine ounces per ton: Silver	Copper-lead and copper-lead-zinc ores: Short tons	Copper-lead and copper-lead-zinc ores: Average recovery in fine ounces per ton: Gold	Copper-lead and copper-lead-zinc ores: Average recovery in fine ounces per ton: Silver	Lead-zinc ore: Short tons	Lead-zinc ore: Average recovery in fine ounces per ton: Gold	Lead-zinc ore: Average recovery in fine ounces per ton: Silver	Total (short tons)
Alaska	.....	....	....	.....	....	....	.....	....	....	4,171,000
Arizona	.....	....	....	.....	....	....	101	0.254	4.45	995,728
California	816	0.064	0.63	8	1.859	29.12	.....	....	....	1,322,100
Colorado	.....	....	....	66	.017	14.91	9,792	....	.20	845,495
Idaho	.....	....	....	121,769	....	28.03	307,573	.001	3.05	1,190,851
Michigan	.....	....	....	.....	....	....	.....	....	....	328,200
Montana	† 43,289	....	.22	60	.025	14.45	152,582	.010	5.18	862,486
Nevada	202	....	....	2,885	.011	11.21	27,302	.015	6.23	1,678,454
New Mexico	78,240	....	....	1,419	.008	15.76	255,946	.076	3.89	1,475,830
Oregon	.....	....	....	.....	....	....	47	.015	1.98	11,557
South Dakota	.....	....	....	.....	....	....	.....	....	....	1,432,555
Texas	.....	....	....	.....	....	....	.....	....	....	63
Utah	47	....	....	.....	....	....	380,489	.056	8.55	4,116,935
Washington	.....	....	....	.....	....	....	48,479	....	.07	53,984
Wyoming	.....	....	....	.....	....	....	.....	....	....	1,071
Eastern States	.....	....	....	.....	....	....	†	....	....	706,405
Total	122,594	.002	.58	126,207	.001	27.49	1,182,311	.036	5.21	19,192,723
Percentage	.64	....	....	.65	....	....	6.16	....	....	100.00
Total, 1932	41,410	....	0.07	167,106	0.003	20.02	815,177	0.062	6.49	21,451,974
Percentage	0.19	....	....	0.78	....	....	3.80	....	....	100.00
Total, 1931	97,950	....	0.06	213,245	0.005	13.09	1,484,530	0.045	4.69	41,985,920
" 1930	249,366	0.001	1.80	246,430	.013	12.39	2,604,926	.026	5.01	53,972,449
" 1929	494,372	.003	3.19	259,126	.015	10.95	3,496,400	.022	4.47	75,653,924

* Current slag fumed.
† Lead ore, zinc ore, and lead-zinc ore yielded no gold or silver.

CANADA'S gold production in October set up a new high monthly record for 1934 and amounted to 265,076 ounces, according to a statement just issued by the Dominion Bureau of Statistics at Ottawa. In September, 244,180 ounces were produced while in August,

the previous record month of the year, the output was 264,870 ounces. Valued at the average price of gold in Canadian funds, of $34.27 per ounce, the October cutput was worth $9,084,155; in the preceding month the average price was $34.18 per ounce and the total production value $8,346,072. During the ten months ending October 2,453,452 ounces of gold were produced in Canada as compared with 2,458,742 ounces a year ago.

Lead—Zinc

THE NRA has completed a code for the zinc industry which is scheduled to be placed before W. A. Harriman, administrative officer, for approval, shortly. The code has been approved by industrial, labor, and advisory boards and has been sent to the review division for final checking, Mr. Harriman said.

ALTERNATES to members of the Code Authority for the lead industry have been recognized by the National Industrial Recovery Board. The approved alternates are:

I. H. Cornell, Andrew Fletcher, C. M. Chapin, Jr., and E. V. Peters, all of the St. Joseph Lead Co., New York City, alternates to Clinton H. Crane, member; H. A. Guess, R. W. Strauss, H. Y. Walker, H. M. Brush, Charles Earl, K. C. Brownell and E. A. Behr, all of the American Smelting and Refining Co., New York City, alternates to F. H. Brownell, member; W. C. Beschorman and Harold Rowe, both of the National Lead Co., New York City, alternates to F. M. Carter, member; C. A. Hight, D. D. Muir, and F. S. Mulock of the U. S. Smelting, Refining and Mining Co., Inc., Boston, Mass.; and F. F. Colcord, U. S. Smelting Refining and Mining Co., Inc., New York City, alternates to F. Y. Robertson, member; D. A. Callahan, Wallace, Idaho; Stanly A. Easton, Bunker Hill and Sullivan Mining and Concentrating Co., Kellogg, Idaho; L. E. Hanley, Hecla Mining Co., Wallace, Idaho; I. H. Cornell, St. Joseph Lead Co., New York City, all alternates to James F. McCarthy, member.

A. G. Mackenzie, American Mining Congress, Salt Lake City, Utah, and Paul H. Hunt, Park Utah Consolidated Mines Co., Keatley, Utah, alternates to Chairman George W. Lambourne, of the mining division; Clarence Glass, Anaconda Sales Co., New York City, alternate to Chairman John A. McCarthy, of the smelting and refining division; W. E. Maston and J. R. MacGregor, both of the Eagle-Picher Lead Co., Cincinnati, Ohio, alternates to Chairman R. M. Roosevelt, of the lead pigments division; E. L. Newhouse, jr., Federated Metals Corp., New York City, alternate to Chairman P. E. Sprague, of the metallic lead products divisions; R. G. McKay, Reynolds Metals Co., New York City, alternates to Chairman W. Y. V. Hunt of the metallic lead foil products division.

CANADIAN 1933 production of lead, tin, and zinc was valued at $4,236,751, a rise of nearly one million dollars as compared with the previous year.

UNITED STATES zinc production in November totaled 35,003 tons, and shipments totaled 29,954 tons. Stocks November 30 were 116,076 tons, which compares with 111,027 October 31 and 101,223 November 30, 1933. Shipments in October totaled 30,307 tons, and in November last year 26,783 tons.

ZINC BUYING is moderate but price is strong at 3.70 cents a pound East St. Louis due to strength of Tri-State ore prices, which promise to advance $1 a ton again this week. Some producers are already asking 3.75 cents for prime western, and it is becoming increasingly difficult to get zinc at 3.70 cents.

Buying of lead in both New York and St. Louis is in good volume at the new price level which is 10 points higher in both market areas. In fact, buying at the new price level has been so good that one of the large producers has been turning down business. Should present rate of buying continue, higher prices can be expected. One large seller in the New York market is asking 3.65 cents for lead here.

Lead at New York is 3.60 cents a pound and at St. Louis 3.45.

TRI-STATE ZINC AND LEAD ORE PRODUCERS ASSOCIATION
Bulletin for Week Ending December 15, 1934
(Dry Tons of 2,000 Pounds)

	Zinc concentrates			Lead concentrates		
	This Week	Last Week	Year Ago	This Week	Last Week	Year Ago
Total stocks (sold and unsold)	18,993	18,028	10,657	17,866	17,535	10,895
Net reserve stock	18,150	17,987	8,937	17,598	17,395	10,905
Production*	7,203	7,267	7,331	1,003	918	794
Shipments	6,238	7,138	7,436	672	490	305
Sales reported	7,040	6,560	5,623	800	490	298
*Included tailing mill production	1,472	1,571	1,405	....	....	....
Base price—Joplin	$26.00	$26.00	$28.50	$34.00	$32.00	$45.00
Metal price—average for week: Zinc, East St. Louis: lead, St. Louis	3.700c	3.700c	4.500c	3.370c	3.350c	4.050c

MILL STATISTICS

	This Week	Last Week
Mine mills operated 32 hours or more	30	30
Mine mills operated less than 32 hours	1	2
Tailing mills operated 96 hours or more	14	16
Tailing mills operated less than 96 hours	2	0
Total mills which produced more than 25 tons during week	47	46
Mills which produced less than 25 tons during week	7	7
Total number of mills operated during week	54	53

TRI-STATE ZINC AND LEAD ORE PRODUCERS ASSOCIATION
Corrected Statistics for Four Weeks Ending Dec. 1, 1934
(Dry Tons of 2,000 Pounds)

	Total stock, sold and unsold	Net reserve stock	Production	Shipments
Zinc Concentrates				
Week ending Nov. 10, 1934	17,844	17,735	7,968	6,363
Week ending Nov. 17, 1934	16,860	16,061	2,680	3,664
Week ending Nov. 24, 1934	17,614	16,656	6,275	5,521
Week ending Dec. 1, 1934	17,899	17,280	8,059	7,774
Total for four week			24,982	23,322
Lead Concentrates				
Week ending Nov. 10, 1934	16,053	16,053	1,037	712
Week ending Nov. 17, 1934	16,111	16,111	490	432
Week ending Nov. 24, 1934	16,649	16,649	851	313
Week ending Dec. 1, 1934	17,107	16,967	1,135	677
Total for four weeks			3,513	2,134

	Zinc	Lead	Combined zinc and lead
Production first 48 weeks, 1934	275,216	35,128	310,344
Production first 48 weeks, 1933	201,529	25,309	226,838
Shipments first 48 weeks, 1934	264,118	28,872	292,990
Shipments first 48 weeks, 1933	235,237	31,161	266,398
Value of shipments first 48 weeks, 1934	$7,113,769	$1,161,736	$8,275,505
Value of shipments first 48 weeks, 1933	6,531,412	1,464,469	7,995,881
Average price of concentrates—four weeks	$24.33	$32.87	$25.04
Average metal price—four weeks	3.723c	3.399c	.....

	Mine mills	Tailing mills	Mills producing less than 25 tons per week	Total
Average number mills operated during month	28	13	4	45

UNDER the head of "United States Lead Refinery Statistics" in this report is comprised the total supply of refined lead as reported from all of the primary refiners, plus most of the refiners of secondary material who produce soft lead, plus foreign lead that is refined here and entered for domestic consumption.

Under the head of refined lead produced from domestic ore is included some secondary lead that it is impracticable to separate statistically month by month, but such lead is accounted for under the head of receipts of scrap in our lead ore report and the derivation of refined lead from such material over a trimestrial period can be determined approximately by deduction.

UNITED STATES LEAD REFINERY STATISTICS
(In Tons of 2,000 Pounds)

1934	Stock at beginning	Production: From domestic ore	Production: Secondary and foreign	Total production	Total supply	Stock at end	Shipments reported
November	229,859	29,755	4,670	34,425	264,284	232,509	31,803
October	230,219	31,243	4,333	35,576	265,795	229,859	35,943
September	234,312	27,070	4,869	31,939	266,251	230,219	36,018
August	240,595	22,999	4,329	27,328	267,923	234,312	33,606
July	238,181	27,354	4,527	31,881	270,062	240,595	29,479
June	233,245	29,695	3,523	33,218	266,463	238,181	28,276
May	222,892	34,741	5,204	39,945	262,837	233,342	29,485
April	221,465	28,723	3,390	32,113	253,578	222,892	30,673
March	216,224	31,379	4,123	35,502	251,726	221,391	30,321
February	207,674	31,892	2,457	34,349	242,023	216,224	25,778
January	203,061	34,818	3,752	38,570	241,631	207,674	33,911
Total	.....	299,914	40,358	340,272	543,333	.....	313,365

Copper

U. S. STOCK of refined copper has decreased 11,500 tons as of November 16, while foreign stocks at the same time increased 4,250 tons. Recent NRA meetings were held to settle quota allotments for domestic producers. Managing Director H. O. King, of the code authority, has released a list of those signing buying agreements. It includes 100 consumers and 25 dealers or producers of copper or ingot metals.

OF INTEREST are recent advices from Russia of the approval of the building plan for a huge copper works combination which, according to reports, will include a mine yielding 15,000,000 tons of ore, a smelter with a yearly production of 100,000 tons, and various other units, including a model village for 46,000 workers.

COPPER is moving into consumption abroad at a pace never before attained in the history of the industry. In November, apparent use for the reporting areas outside the United States was just under 201,000,000 pounds, the largest total for any month on record.

The November total compared with an aggregate of 184,000,000 pounds in October, and an average of 160,000,000 for the first 11 months of 1934.

Total for this country in November was 53,000,000 pounds, and the average for the first 11 months was 70,000,000 pounds.

Increasing demand from abroad has been mirrored in firmer foreign prices for the red metal. Copper shipments for European destinations are at 7 to 7.05 cents a pound c. i. f. Hamburg, Havre, and London, against 6.80 cents a few weeks ago, and a low of 4½ cents in 1932.

Another factor in the upturn in the price of copper abroad has been the agreement of foreign copper producers to meet in New York January 15 to discuss the curtailment of production outside the United States. There have been reports that output of foreign mines will be reduced to 80 percent of the current rate, but no detailed program has been worked out. However, all important foreign producers have expressed a willingness to cooperate, and definite control of output outside the United States is now regarded as simply a matter of time.

How important such a step will be is demonstrated by the fact that foreign stocks of copper have increased 11,500,000 pounds since January 1, 1934, notwithstanding the large gain in foreign consumption. In the United States, the principal companies have gained a much better control of the production situation, as evidenced by a decrease since the first of the year of 338,000,000 pounds in refined stocks of copper, despite indifferent demand.

NOW, FOR A LOT OF COOPERATION

—The Sunday Star

In November stocks of refined copper in North and South America were reduced 37,000,000 pounds, practically entirely in the United States. However, as stocks of refined copper outside North and South America increased approximately 9,500,000 pounds, world stock reduction for the month was 27,500,000 pounds. — (*From the Wall Street Journal.*)

AT A REORGANIZATION meeting of the Copper & Brass Research Association held at its offices, 25 Broadway, New York, the mining companies withdrew and the fabricating members formulated plans for a promotional campaign for the forthcoming year.

The following officers were elected: President, F. S. Chase, president of Chase Brass & Copper Company.

Vice presidents, John A. Coe, president of the American Brass Company; C. D. Dallas, president of Revere Copper and Brass, Inc.; Wylie Brown, president of Phelps Dodge Copper Products Corporation.

Treasurer, C. T. Ulrich, vice president and treasurer of Kennecott Copper Corporation.

Secretary, B. B. Caddle.

Those elected to the board of directors are: F. S. Chase and R. L. Coe, Chase Brass & Copper Company; C. D. Dallas and J. A. Doucett, Revere Copper and Brass, Inc.; John A. Coe and John A. Coe, Jr., the American Brass Company; E. O. Goss and W. M. Goss, Scoville Manufacturing Company; R. E. Day and Herman W. Steinkraus, Bridgeport Brass Company; Wylie Brown and H. A. Staples, Phelps Dodge Copper Products Corporation; C. C. Limbocker, Wolverine Tube Company; C. T. Ulrich, Kennecott Copper Corporation; and B. B. Caddle, secretary of the association.

An operating committee consisting of J. A. Doucett (chairman), R. L. Coe, John A. Coe, Jr., Herman W. Steinkraus, and W. M. Goss was appointed.

Iron—Steel

ACCORDING to *Skillings Review*, the iron ore industry's outlook for 1935 is a happier one. They say:

"Now that the iron ore season on the Great Lakes is concluded, thought turns to stocks on hand, the probable winter consumption, and prospective shipments in the 1935 season of navigation. The sinking spell in the steel industry in the last half of the season of 1934 was reflected in curtailed movement of ore, but the season ended 2.89 percent ahead of 1933, and with the percentage of active steel capacity slowly but steadily increasing. The prospects now are that steel operations will have recovered to as much as 40 percent early in 1935, and go into the second quarter of 1935 with every encouragement for a restored industry, after five long and unprofitable years. A situation such as that will naturally be reflected in the iron ore industry. Looking forward, there seems reason to expect a good increase in ore shipments in 1935 over the record of 22,249,600 gross tons in 1934.

"Details of the 1934 season will be found in the table accompanying this article, compiled by the Lake Superior Iron Ore Association.

"On May 1, 1934, the stocks of iron ore on hand at Lake Erie and in furnace yards totaled 28,314,417 gross tons, and 22,249,600 tons were shipped during the season just ended. As of November 1 the stocks of iron ore on Lake Erie docks and at furnaces totaled 36,341,007 tons. During the six months November to April, inclusive, it may be expected that present stocks will be reduced to about 25,000,000 tons as of May 1, 1935. That point would not have any special significance, however, unless expectations of increased consumption are realized during the coming year. There seems to be good reason to believe that these hopes will be realized.

"Confusion in the administration at Washington, confiscatory taxes in Minnesota, and the fight waged by union labor in an effort to control the industry have all had their effect to delay restoration of normal conditions and therefore has delayed nation-wide recovery of business and industry. Assuming that the confusion is ended at Washington, and the situation there most certainly is greatly improved; that the steel industry can obtain relief from burdensome taxation, and that union labor will cooperate, as it promised in June, 1933, to do in the restoration of prosperity, instead of waging a hopeless fight to control the steel industry, the way will be reopened for steel to surge forward and bring prosperity for the nation in its wake. If we have arrived at that happy stage, the iron ore movement from the Lake Superior district in 1935 should be not less than 30,000,000 tons. Otherwise the gain compared with 1934 may be slight, as it was this season when compared with 1933. The increased consumption of steel scrap tends to reduce the demand for iron ore."

EUGENE G. GRACE, president of the Bethlehem Steel Corporation, was elected president of the American Iron and Steel Institute by the unanimous vote of the board of directors of the Institute. Tom M. Girdler, chairman and president of the Republic Steel Corporation, was elected a vice president to succeed Mr. Grace in that position.

Coal

IMPORTANT trends for the future of the coal industry are contained in the report of the National Resources Board, made public recently. The report, containing as it did long-range plans for all natural resources, attracted national attention as being indicative of further administration policy in these fields. Coal production moved upward for the week ended December 8 after the holiday slump. Of further interest to coal producers is the new outlook in the industrial store scrip question and the recent ruling of the chairman of the NIR Board regarding a series of open hearings which would indicate important changes in code operations.

While the resources report did not contain the full summary and recommendations on the minerals planning section, which is expected to be made available within the next two weeks, there was ample evidence that the administration has given a great deal of attention to the eventual welfare of the mining industry. Problems of conservation of natural resources and suggestions of closer cooperation between governmental agencies and the mining industry are indicated in the report.

BITUMINOUS production increased 893,000 tons over the previous week's total for the week ended December 8, according to figures compiled by the Bureau of Mines. Total production was 7,100,000 net tons, which is 106,000 tons under the production for the week ended November 24 preceding the Thanksgiving holiday. The December 8 production figure was, however, 600,000 tons over the same week in 1933 and 300,000 tons over the corresponding week in 1932.

THIS SUSPENSE IS AWFUL!

—The Washington Daily News

Anthracite production, on the other hand, failed to show an increase after the holiday slump when only five active days of production were recorded. Total output for the week ended December 8 was estimated at 707,000 tons, a decrease of 72,000 tons from the previous week. Production in the corresponding week last year was 880,000 tons.

A SPEEDY decision on the question of industrial store scrip payments and pay-roll checkoffs is expected, probably before the January 6 expiration date of the present stay order of the code section which prohibited scrip and pay-roll checkoffs. The number of representations made to the NRA in connection with this subject by numerous organizations, among which the American Mining Congress took a leading part, is believed to have convinced high officials of the NRA that the original prohibitory order was inadvisable. Washington commentators expect that the entire section relating to the proscribing of scrip payments and pay-roll checkoffs in industrial stores will be eliminated.

A NATIONAL program which, according to its sponsors, would put 600,000 men in permanent jobs and prove of real worth in a program of rural electrification has been proposed to Secretary of the Interior Ickes by the National Job Saving & Investment Protection Bureau for the coal industry.

According to George J. Leahy, chairman of the organization, the program is predicated on the electrification of the homes of 43,000,000 farm residents. Leahy hit at the proposed Federal hydroelectric power development by suggesting curtailment of the proposed expansion and substitution of electrical development from present sources.

The Government plan eventually will cost more than $4,000,000,000 and put some 200,000 men out of work, meanwhile electrifying a small percentage of the several hundred thousand rural homes, Leahy declares. He points out that the coal industry's program would put almost 600,000 men to work permanently and could more speedily electrify 6,000,000 farms in place of the smaller number projected under the present Federal plan of power expansion.

Leahy added that his organization recommended to the Secretary of the Interior that a committee representing the coal industry, railroads, utilities, and the Public Works Administration be appointed to discuss the possibilities outlined in the coal organization's program.

A PROPOSED budget of $116,750 for the period from October 2, 1933, to April 30, 1934, was submitted to NIR Board for approval by the Ohio subdivisional code authority of Division No. 1 of the bituminous coal industry.

Basis of contribution is 1 mill per ton on the production for the year 1932, with a minimum of $10; and three-fourths of a cent per ton monthly beginning with October, 1933.

THE TOTAL production of anthracite (which includes colliery fuel) for the week ending December 8, as estimated by the United States Bureau of Mines, Department of the Interior, Washington, D. C., amounted to 707,000 net tons. This is a decrease, as compared with production of the preceding week, of 72,000 net tons, or 9.2 percent. Production during the corresponding week in 1933 amounted to 880,000 tons.

SHIPMENTS of anthracite for the month of November, 1934, as reported to the Anthracite Institute, amounted to 3,600,652 net tons. This is a decrease, as compared with shipments during the preceding month of October, of 426,058 net tons, or 10.58 percent, and when compared with November, 1933, shows a decrease of 497,578 net tons, or 12.14 percent.

THOSE who visited the recent World's Fair in Chicago will recall that one of the central features of the Anthracite Institute booth was a small-scale model of a modern anthracite basement. It represents a room furnished in modern style in which an anthracite heat machine, coal and ash conveyor, are very attractively blended. This glass-enclosed exhibit, with its handsome tile base, was recently accepted by the Franklin Institute of Philadelphia, and will shortly make its public appearance in the new museum on the Parkway.

WITH 1,578 MEN ENROLLED in the 48 mining extension classes of the West Virginia University School of Mines, the largest regular enrollment ever had by the department since its start with three summer course students in 1913 has been reached. This total of 1,578 is two more than the 1,576 men enrolled in 1924 and 547 greater than the enrollment at the same time last year.

The increased interest represented by the above classes is a reflection of the renewed interest of the mining men of the state in the state's largest single industry—coal mining and shows the confidence of these men in this industry. The men attend the classes with the sole purpose of making themselves better mining men and to prepare themselves to advance in the coal industry. A large number of these students will make up the body of the mine foremen and other officials of the future in West Virginia.

These classes, which are under the supervision of the University School of Mines and are aided by the Federal and State boards of vocational education, are for those men employed in the coal mines of West Virginia. The fact that these classes reach the persons for whom they are intended is shown by the fact that the ages of the men range from 16 to over 70 years and the men average 31 years in age and 13 years in practical mining experience. During the past 21 years over 23,000 men in West Virginia have been enrolled in these courses.

WILLIAM G. CAPERTON, vice president, Slab Fork Coal Co., was reelected president of the Smokeless Coal Operators Association of West Virginia at its annual meeting December 13 in New York City. The following officers were also reelected: R. H. Knode, president, Stonega Coke & Coal Co., and E. C. Page, president, Crozer Coal & Coke Co. —vice presidents H. R. Hawthorne, vice president, Pocahontas Fuel Co.—treasurer; and Holly Stover, Washington, D. C., secretary.

A NEW DEPARTURE in NRA operations was sounded this week in an announcement by S. Clay Williams, chairman of the NIR board. Beginning January 9, the board itself, will begin a series of hearings at which evidence will be collected on the operation of major code provisions and the advisability of amendment or continuation of these codes. The first hearing will concern itself with price control and price fixing. Further announcement will be made of succeeding topics and dates. Inefficacy of many code operations is believed to be behind the decision. Mr. Williams claimed reports on price control, indicating that code provisions for mandatory costing systems designed to set minimum prices, and permanent schedules of prices have not operated in the best interest of the industrial structure. Much of the information before the board tends to show, it was stated, that such provisions have not accomplished the desired purpose and have proved neither workable or enforceable.

THE ANNUAL MEETING of The Northwest Mining Association was held at Spokane, Wash., December 13-14-15. Numerous resolutions were adopted among them being the following:

"That the Northwest Mining Association, comprising producers of gold, silver, lead, zinc, copper, iron, coal and other minerals, in 40th Annual Convention assembled this 15th day of December, 1934, in Spokane, Washington, does hereby call upon the President and Congress of the United States to cast off the shackles of the international money changers, and to restore to the American people the sound money of their forefathers, by the immediate and unconditional remonetization of silver at its historic ratio of 16 to 1.

"That the Congress of the United States, be, and hereby is, urged to restore the activities of the Bureau of Mines, through sufficient appropriations to expand the studies and application of measures to reduce the hazards and prevent occupational diseases prevalent in the mining industry, and that the experiment stations and service cars be rehabilitated and fully equipped as to personnel and otherwise in the interest of those engaged in the mineral industry.

"That the Federal government be urged to give such protection as will enable domestic producers to market their output in competition with foreign importations."

The convention agreed upon a permanent date for the Annual Meeting, selecting Thursday, Friday, and Saturday, following the first Wednesday in December of each year.

YOO-HOO, PROSPERITY

—The Washington Daily News

DOUBLE DUTY!

—The Washington Daily News

BELL & ZOLLER Coal & Mining Company has awarded to the Robins Conveying Belt Company a contract for the design and construction of what will be the largest bituminous coal washing plant in the United States. Roberts & Schaefer Company will have the dry cleaning feature of the plant. The new washery will be located at Ziegler, Franklin County, Ill., and will have a capacity of 1,000 tons per hour. It will mechanically clean all coal under six inches. Work will be started immediately and the plant will be in operation within seven months. The cost will be approximately $600,000.

HOWARD COONLEY, president of the Walworth Company, was reelected president of the American Standards Association for 1935. Frederick E. Moskovics, representing the Society of Automotive Engineers, was reelected vice-president. Mr. Coonley, who represents the American Society of Mechanical Engineers, has served two terms as president.

Twenty-two new American standards of interest to the lumber, jewelry, pipe, gas and gas appliance, electrical, paper, textile, petroleum, and construction industries were approved by the Association during the year.

Natural Resources Board

THE PRELIMINARY REPORT of the Planning Committee for Mineral Policy, incorporated into the National Resources Board, is of particular interest to the mining industry. While the full report comprises 52 printed pages and is not yet available, the summary of recommendations already made, indicates the full text of the report. The length of the preliminary report (seven printed pages) precludes its inclusion. Pertinent extracts, however, follow:

"In introducing its report, the committee calls attention to the importance of the mineral industry and to the fact that it has developed without the aid of any consistent national policy. The facts that warrant special consideration for the mineral industry and a unified policy for its guidance are: (1) That minerals are exhaustible and nonreproduceable; (2) that some minerals do not exist in the United States in quantities adequate for national welfare; (3) that others exist in present surplus; (4) that geographic distribution is fixed by nature and cannot be changed by enactment, thereby determining trade routes and trade areas, both domestic and foreign; (5) that there are special hazards, both physical and economic, in mining; (6) that closing down a mine may result in losses far more serious than closing down a factory. . . .

"Forecasts of consumption are necessary to prevent the over-expansion of capacity—one of the major causes of instability and waste. Forecasts have been of great value in the petroleum industry, but they have not been attempted by other mineral industries for a number of reasons. The forecasting agency should be a governmental body, probably the Bureau of Mines, acting in cooperation with representatives of producers and consumers. . . .

"The committee's general recommendations as to production and capacity control in the mineral industries burdened with a present surplus of plant capacity are: (1) That the emergency provisions of the NRA codes for production control be continued in some form; (2) that in some cases, such as bituminous coal, provision for minimum and maximum prices may also be needed; (3) that action by Congress be considered establishing an agency to authorize control of production and capacity, and in special circumstances of prices, where uncontrolled competition is found to result in serious resource waste, with all necessary safeguards for the protection of the mine workers and consumers. . . .

"The history of the administration and the present status of minerals on public lands is presented with a listing of the possible advantages and disadvantages of Government control and management under the leasing system adopted in 1920. The advantages briefly are: (1) A substantial revenue is collected in which the interested states share; (2) waste in mining is controlled; (3) adjustment of production to market needs is aided; (4) control of monopoly is aided; (5) safety standards are improved; (6) maintenance of reserves of essential minerals can be assured. The disadvantages are: (1) Increase of Government staffs and costs; (2) interference with freedom of action of citizens; (3) dangers to effective administration through withholding essential appropriations; (4) instability of policies under changing administrations; (5) chance of political favoritism.

"The committee concludes that the advantages of the leasing system outweigh the drawbacks and that it should be extended, in much simplified form, to all public owned mineral deposits in the United States proper. . . .

"The committee approves the policy of retaining ownership of mineral deposits on public lands, but does not favor at the present time the general extension of public ownership over deposits of minerals that have passed into private hands. It favors the retention of the system of private operation, with Government supervision when necessary. . . .

"We . . . recommend that permanent provision be made to authorize control of competition after the expiration of the present National Recovery Act. We shall not attempt to outline the specific steps applicable in each industry, but, in general, the authorization should cover the control of production, of capacity, of surplus stocks, and where necessary, of price. The choice of specific methods of control is a technical matter, which should be left as far as possible to the supervising authority, acting in council with the industry concerned. From the point of view of the consumer the choice of methods makes little difference, since any minimum price, if observed, necessarily affects production, and any control of production necessarily affects price. The authorization of control should be made contingent on acceptance of whatever safeguards are thought necessary by Congress to protect the interests of the mine workers and the consumer, and upon assurance by the industry concerned that action will be taken to minimize resources waste. . . .

"In addition to these immediate steps, there is need of continuous study and review of national policy in relation to the minerals, and of the results obtained. This might well be carried on by a permanent mineral policy committee working in cooperation with the National Resources Board. The present committee is already studying a number of special problems centering around mine taxation, tariffs, foreign trade, capacity, and reserves concerning which recommendations will be made later. . . .

"Hazards to life and limb are still excessive, despite progress in the prevention of mine accidents. Since the welfare of the worker is the concern of all agencies of government, the health and safety of miners must be considered as part of any general plan. . . ."

Present-Day Diamond Core Drilling

(*Continued from page* 40)

Gold has been mined for many years on the Rand in Africa and it has long been suspected that extension of the reefs existed. However, the old price of gold did not justify the cost of drilling to test the ground. The current value of gold warrants further prospecting and a large number of drills are now being used wherever the possibility of a reef exists. On the Rand, as elsewhere, a new type of drill has been developed to meet local requirements. Gasoline is expensive on the Rand and so is steam power. Consequently, a new type of drill was designed driven by a Diesel engine and is now in use. The holes on the Rand are deep, running 5,000 feet and more.

Up to 1928 Brazilian black carbons were used as the cutting medium in drill bits. In 1928 small African bortz were experimented with and were found to be very satisfactory for average conditions. Bortz cost only a fraction as much as Brazilian black carbons and have greatly lowered the per foot cost of cutting medium, as well as obtaining faster progress. In badly broken siliceous ground African bortz are not satisfactory because they are small and break quickly under these conditions.

A notable improvement in core drill construction is the change of the general line-up of fittings. The four sizes of fittings are named respectively "E," "A," "B" and "N." The sizes "A," "B" and "N" were developed for larger diameter holes, but no effort was formerly made to effect a nesting of casing for these sizes.

During 1928 and 1929 the U. S. Bureau of Standards in cooperation with the Association of Diamond Drill Manufacturers developed the so-called "X" series of fittings, standardized bit, core barrel and casing sizes and arranged these sizes so that a string of "E" casing will nest within "A," "A" within "B," and "B" within "N." This change removes almost entirely the necessity of reaming the hole in changing from one size to another, and together with the standardization of parts results in added convenience and increased savings to users.

Following closely the expansion of the mining industry to new and wider fields the diamond core drill with its constantly improved design is meeting the most exacting requirements of miner and engineer in their new ventures.

A. W. ROBERTSON, chairman, Westinghouse Electric & Manufacturing Co., recently pointed out that "Business and government are beginning to pull together. The load is beginning to move. As these two forces learn to work in harmony under the new conditions, marked improvement in economic conditions may be expected. Prospects for next year are good."

Rights to Sub-Surface Waters From Mining Operations

(*Continued from page* 34)

not make the law any more than the will of this Congress makes labor law at the present time.

In Nevada, Utah and Wyoming, those are three out of seven states I have mentioned, it is held that that known tributary underground water, if it occur in your mine, or occur in your land of any other kind, may be held by you if you can get it, and without regard to consequences upon your neighbor.

I think that completes an analysis of the different bodies of underground water and the law applicable to them, except for the mention of certain presumptions.

One of your number wrote me a letter in which he wanted to know whether there are any presumptions about whether or not percolating water is tributary to a stream. There are some presumptions respecting underground water law. One of them is to the effect that all underground water is percolating water and not stream water. That is a little help to the owner of the land in which that percolating water is found because he might be able to establish further that it is non-tributary percolating water, and that would be all the more of a help. But there is a presumption that underground water is not stream water, that it is percolating water. It is true that this is only a presumption, and that the other side may come forward and show that, after all, it is tributary. But the presumption is against him and the burden of proof is on him.

Then, there is another presumption, which is that percolating water that is rather remote from a stream, does not reach it. The burden of proof is on the man who claims that it does.

So the mining industry has made a great contribution to the water law of the West. In fact, it is responsible for the gift of two branches of law to American jurisprudence:

1. Water law.
2. Mining law.

I heard Dean Probert tell us that we had made such great progress based upon the discovery and treatment of our metals. So we have! The mining industry is to be credited with that progress. But I think that the mining industry has done perhaps more than it has thought, because it has given to us this appropriation system of water law, and we must remember that we rise to higher things not merely upon engines and motors and metals, but upon the character of our laws and our institutions.

FREDERICK M. BECKET has been elected an honorary member of the Electrochemical Society.

BOOK REVIEW

Ores and Industry in South America, *by H. Foster Bain and Thomas Thornton Read.* 381 *pages, illustrated. Published for the Council on Foreign Relation, New York, by Harper and Brothers,* 1934. *Price,* $3.50.

THE authors of this work, which should be used as a school text and by firms doing or contemplating doing business in or with South America, are traveled and observant engineers, as well as keen readers of essays on international affairs, and have an extensive circle of engineer friends, who also move from one country to another. Bain has spent considerable periods in Chile, Argentina, and Colombia, and Read in Brazil. To bring conditions up to date, the authors incorporated in their book the opinions of others who know South America. Therefore, this smooth-reading volume is entirely reliable. Bain is also author of "Ores and Industry in the Far East," in its second edition and published by the Council on Foreign Relations.

"Ores and Industry in South America" is based on the authors' theme—"Will South America become one of the great industrial regions of the world or continue, in the main, its present role as a provider of raw materials? Will circumstances or the inherent tendencies of its people conspire to defeat the widely held, but possibly poorly based, anticipations of the future?" Thereupon follow 370 pages concerning the discovery of the southern continent and the origin of its republics, the people that have controlled them through four centuries, geography, physiography, climate, geology, mineral reserves and production, industries, agriculture, politics, and economics, including foreign trade. The general deficiency of fuels and important metallic minerals of Argentina; the silver and tin of Bolivia; the diamonds, gold, iron, and manganese of Brazil; the coal, copper, iron, and nitrate of Chile; the emeralds, gold, petroleum, and platinum of Colombia; the gold and petroleum of Ecuador; the bauxite, gold, and diamonds of the Guianas; the copper, petroleum, and vanadium of Peru; Paraguay and Uruguay, poorly endowed with mineral resources; and the iron and petroleum of Venezuela are all thoroughly described and analyzed. We wish we had space to tabulate these items to show them at a glance.

As to who owns the mineral resources of South America, United States interests control the bulk of the productive mineral resources, most of the remainder by domestic capital, and a small portion by British groups and a substantial share of the oil by a British-Netherlands combine.

As an answer to their original question, the authors conclude that South America is a continent with a future, but not a spectacular one in industry—rather one of slow development and along existing lines. It is destined for a considerable period to remain in its past role of exporter of minerals either in the raw or but simply processed condition. South America is not a vast reservoir of untouched wealth, excepting perhaps in iron and petroleum. Apart from some domestic capital, the minerals of the country have been developed by large foreign corporations who have improved the standards of living in those localities. Development of Bolivia, Chile, and Peru has been mainly due to the mineral industries; that of Argentina and Brazil is the result of agriculture. It is doubtful whether the peoples desire to change their present status. Under the impulse of national aspirations and planning, local industries may be expected to be stimulated and protected, but in general it will be more profitable to sell the surplus of mineral raw materials and purchase finished or partly finished goods than to manufacture on any large scale.

M. W. VON BERNEWITZ.

THE ACQUISITION of all gas rights in 50,000 acres comprising the Cliftside helium-bearing gas field near Amarillo, Tex., has been completed by the Bureau of Mines. This field supplies the raw material from which all helium used by the military services of the nation is extracted. In addition to supplying current requirements, the field provides a large reserve for future lighter-than-air craft operations by the Army and Navy. The bureau made a thorough study of the field and, considering all factors, determined that this field was the best reserve of helium-bearing gas then known. No comparable field has been discovered. Production of helium at the Amarillo plant was started in April, 1929. In five years of operation, the plant has produced more than 57,000,000 cu. ft. of helium or about one-half of all that element so far recovered.

AMONG the many prominent mining officials in attendance at the December meeting of the Mining Congress were: Edward C. Congdon, of Duluth, Minn.; C. S. Robinson, president, Buckeye Coal Company; Wm. P. Cayton, president, Rail and River Coal Co.; Cleveland E. Dodge, vice president, Phelps Dodge Corporation; J. M. Hughes of the Northwestern Improvement Co., St. Paul, Minn.; F. S. Pfahler, president, Superior Coal Co.; Andrew Fletcher, of the St. Joseph Lead Company; Paul Weir, vice president, Bell & Zoller Coal & Mining Co.; D. D. Dodge, of W. J. Rainey, Inc.; Moroni Heiner, president, Utah Fuel Co., Salt Lake City, Utah; J. G. Puterbaugh, president, McAlester Fuel Company; W. N. Smith, of the Vinegar Hill Mining Co., Platteville, Wis.; T. J. Thomas, president, Valier Coal Co.; and Carl Zapffe, of the Northern Pacific Company, Brainerd, Minn.

PERSONALS

A "Government Relations Committee" of the National Coal Association has been appointed, with the following members: **Charles O'Neil**, (chairman), vice president, Peale, Peacock & Kerr, Inc.; **C. C. Dickinson**, president, Dickinson Fuel Company; **Milton H. Fies**, vice president, DeBardeleben Coal Corp.; **Geo. B. Harrington**, president, Chicago, Wilmington & Franklin Coal Co.; **Douglas Millard**, vice president, Colorado Fuel & Iron Products Co.; **J. D. A. Morrow**, president, Pittsburgh Coal Co.; **R. H. Sherwood**, president, Central Indiana Coal Co.; **Geo. K. Smith**, president, Sunday Creek Coal Co.; **H. J. Weeks**, general manager, Durham Land Company; and **J. L. Steinbugler**, president, Wm. C. Atwater & Company.

H. Foster Bain has sailed for Australia and New Zealand on an observation trip.

Philip Wiseman has been elected a director of the Zenda Gold Mining Company.

Paul D. Merica, Assistant to the President, The International Nickel Co., of Canada, Ltd., has been named a director of that company.

O. P. Hood, with **A. C. Fieldner** as alternate, has been appointed as the representative of the U. S. Bureau of Mines on the Standards Council of the American Standards Association.

The Monarch Anthracite Mining Company, with **James H. Pierce** as president, has been formed to operate the Mineral Springs colliery under lease from the Lehigh Valley Coal Co.

Albert L. Deane, President of General Motors Holding Corporation, was in Washington last month to present to the meeting of the Mining Congress his plan for industrial recovery.

E. C. Alvord, prominent Washington attorney, presided as toastmaster at the annual dinner of the American Mining Congress which was held at the Mayflower Hotel, Washington, D. C., December 13.

Among the visitors at The American Mining Congress headquarters in Washington during December were **William J. Woods**, Lewistown Glass Sand Company; **H. G. Phillips**, Owens Illinois Glass Company, and **L. E. Lindower** and **M. G. Leatherman** of the same company.

Clinton L. Bardo, president, National Association of Manufacturers, and **Dr. Wilson Compton**, manager-secretary, National Lumber Manufacturers Association, represented their respective industries in the discussion "Need for Cooperative Action" at the Washington meeting of the Mining Congress in December.

At the December 5 meeting of the Coal Mining Institute of America, held in Pittsburgh, **Frank B. Dunbar** of Mather Collieries presided at an open forum question box session. Speakers included **F. R. Vinton**, **Richard T. Todhunter**, **S. J. Craighead**, **W. H. Glasgow**, **R. C. Beerbower**, and **W. L. Affelder**. **Dr. L. E. Young**, vice president, Pittsburgh Coal Company, gave an illustrated talk on his recent visit to mining districts of Europe.

G. W. Riggs, Uniontown, Pa., was elected president of the Coal Mining Institute of America in annual meeting, December 5. Mr. Riggs succeeded **C. L. Lutton** of Pittsburgh. The following elections were made: vice presidents, **G. S. McCaa**, **W. R. Chedsey**, and **C. W. Pollack**; directors for two years, **M. L. Coulter**, **J. J. Forbes**, **E. A. Holbrook**, **C. L. Lutton**, and **F. B. Dunbar**; directors for one year, **J. V. Berry**, **J. W. Paul**, **Newell G. Alford**, **Richard Maize**, and **C. F. Keck**.

Thomas Allen, mining engineer and rescue expert, Grand Junction, Colo., has been appointed chief inspector of coal mines for Colorado, succeeding the late **James Dalrymple**.

H. B. Fernald of Loomis, Suffern & Fernald, New York City, presented to the December meeting of the American Mining Congress a report of the work of the Congress' National Tax Committee of which he is chairman.

J. R. Hobbins, vice president, Anaconda Copper Mining Company, Butte, Montana, was elected to the Board of Directors of The American Mining Congress at its annual December meeting.

Howard I. Young, president, American Zinz, Lead & Smelting Company, was reelected president of The American Mining Congress for 1935.

George R. Collins, formerly vice president, secretary and treasurer, Winding Gulf Collieries and the Smokeless Fuel Co., Charleston, W. Va., has been elected chairman of the board of the two companies. **L. Epperly**, formerly vice president and general manager, succeeded the late **Justus Collins** as president of the collieries company and vice president of the fuel company.

L. W. Kelly, formerly superintendent, Clyde No. 3 Mine, W. J. Rainey, Inc., has accepted the general superintendency of the operations of the Cosgrove-Meehan Coal Co., of Pennsylvania, with headquarters at Johnstown, Pa.

W. M. Lacey, formerly general superintendent, eastern division, DeBardeleben Coal Corporation, has been appointed manager of mines, Montevallo Coal Mining Co., Aldrich, Ala.

D. A. Thomas, president, Montevallo Coal Mining Co., Birmingham, Ala., has been elected president of the Alabama Mining Institute.

J. P. Williams, Jr., President of the Koppers Coal Company, succeeded **C. E. Bockus** as President of the National Coal Association, with **R. L. Ireland, Jr.**, Vice President of the Hanna Coal Company, and **C. F. Spencer** as vice presidents. **W. D. Ord** was reelected treasurer of the Association.

W. J. Loring of the Arizona Comstock Corporation, Virginia City, Nevada, has recently spent considerable time in Chicago in connection with affairs of his company.

Among mining leaders who participated in the program of the Washington meeting of The American Mining Congress in December were **Chas. H. Segerstrom**, president, Carson Hill Mining Company, Sonora, Calif.; **Louis C. Madeira, III**, Executive Director, Anthracite Institute, New York City, representing the anthracite industry; **D. D. Moffat**, vice president, Utah Copper Company, Salt Lake City, Utah; **Howard I. Young**, president, American Zinc, Lead & Smelting Co., St. Louis, Mo.; **R. C. Allen**, vice president, Oglebay Norton & Company; **J. P. Williams, Jr.**, President, Koppers Coal Co., Pittsburgh; **A. E. Petermann**, counsel, Calumet & Hecla Cons. Copper Co., New York City; **E. J. Newbaker**, vice president, The Berwind-White Coal Mining Co., Windber, Pa.; **J. B. Putnam** of Pickands Mather & Co., Cleveland, Ohio; **Eugene McAuliffe**, president, Union Pacific Coal Co., Omaha, Nebr.; **A. E. Bendelari**, president, The Eagle-Picher Lead Company, Cincinnati, Ohio; **W. J. Jenkins**, president, Consolidated Coal Co., of St. Louis, St. Louis, Mo.; and **S. L. Mather**, vice president, The Cleveland-Cliffs Iron Company, Cleveland, Ohio.

Axel P. Ramstedt of Wallace, Idaho, was in Washington last month to attend the meeting of the Mining Congress as representative of the Coeur d'Alene District.

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NEWS OF THE MANUFACTURERS

F. A. MERRICK, president, Westinghouse Electric & Manufacturing Co., recently said: "The year 1934 closes as another in which the spring and early summer improvement in most lines of business was followed by the late summer and fall decline in those indices which gauge the standing of industrial activity. Notwithstanding these recent declines, the fact remains that the year as a whole will show improved returns as compared with 1933. With the many complexities of existing circumstances as to both governmental and business problems, it is too much to expect that the progress toward recovery will be in one unbroken line of steady improvement. The recently evidenced willingness of Government and business to consolidate their common desire and activities for the promotion of recovery on a realistic basis is the most favorable augury for progress to that end in the year 1935. The electrical manufacturing industry has shared in the gains of the past year, but is still operating at a rate little better than half of what could be called normal. During 1935 further improvement is expected."

EVERYONE interested in power equipment is invited to attend what promises to be the biggest machinery exhibit of 1935, to be held in the display room of Caterpillar Tractor Co. at Peoria, Ill., from January 8 to 20, inclusive.

SUFFICIENT electric energy to operate an electric motor can be obtained directly from sunlight with a new photoelectric cell, far more sensitive than usual ones of its type, that has been produced in the General Electric Research Laboratory at Schenectady. Even the light from an incandescent lamp, falling on such cells, is sufficient to operate the motor.

Four of the cells, connected together, operate a motor that is rated at four ten-millionths of a horsepower. Enough light energy is converted into electricity when a 75-watt incandescent lamp is lighted at a distance of 8 in. from the cells so that the motor, using three ten-thousandths of an ampere of current, turns at good speed.

INGERSOLL-RAND announces performance of a small machine weighing about 20 pounds that will spin down a 1-in. or larger nut at 700 r. p. m. and then give it a series of smart torsional blows at the rate of 1,400 a minute to tighten it as securely as desired.

In the Ingersoll-Rand Pott impact wrench a principle entirely new to the pneumatic tool field is brought into play; that of the rubber "accumulator." This is a cylindrical block of special rubber interposed between the "multi-vane" air motor and the chuck. In operation, the torque from the motor is applied to the accumulator which, in twisting, becomes shortened, lifting the "hammer" from engagement with the "anvil." The hammer is then released and is spun forward to the next engagement, thus delivering a powerful blow, with considerable mass behind it, to the anvil, on the end of which the chuck is attached.

These torsional impacts occurring at the rate of 1,200 to 1,400 blows a minute exert a more powerful turning effect than is possible with any other portable wrench. This type of turning action, new to a power wrench, makes it possible to remove nuts which could not be taken off except by splitting with a chisel or burning with a torch. One man operates this wrench with ease.

For additional information concerning the Ingersoll-Rand Pott impact wrench, address Ingersoll-Rand Company, 11 Broadway, New York City, and ask for descriptive pamphlet No. 2152.

MINE SAFETY Appliances Company, Pittsburgh, Pa., has just issued a new bulletin describing their all-service gas mask which affords sure protection against carbon monoxide and all other poisonous gases where there is sufficient oxygen present to sustain life. Copies of this informative bulletin are available by addressing this publication or the manufacturer direct.

LEAFLET 2182, descriptive of the new Seal-Clad induction motor, with protected windings, has been issued by Allis-Chalmers Manufacturing Co., Milwaukee. This is descriptive of Seal-Clad motors built in ratings up to 25 hp., 1,800 r. p. m., furnished with either ball or sleeve bearings.

AN ADVANCED development of its two-stage Monobloc centrifugal pump is announced by the Worthington Pump & Machinery Corporation, of Harrison, N. J.

DIRECTORS OF BLAW-KNOX CO., today elected Robert F. McCloskey director and vice-president in charge of operations of the plants located at Blawnox, Pa., to replace Wayne Rawley, deceased. Mr. McCloskey was previously general superintendent of the company's Blawnox shops. He has been associated with the company since 1920, starting as manager of a plant then located at Wheatland, Pa. In 1922 he was made production manager of shops at Blawnox, and in 1931 became general superintendent.

HYDROTATOR CO. announces they have licensed the Wilmot Engineering Company, of Hazelton, Pa., to represent them in the manufacture and sale of the Hydrotator coal-cleaning process and the Hydrotator classifier.

They also announce that in the near future a new Hydrotator will be presented. This improved design, while embodying the fundamental principles which have made the Hydrotator so successful, will be simpler, more efficient, and so changed as to widen the range of sizes cleaned by the process. All inquiries and orders for Hydrotators and repair parts should be addressed to the Wilmot Engineering Company, Hazleton, Pa.

THE RECORD of equipment paying for itself in six months time, through savings effected by its use, was established by a 45 hp. turbine manufactured by the Elliott Company, Pittsburgh, Pa. This turbine, which operates on natural gas and drives a centrifugal water pump, is used by the Athletic Mining and Smelting Company, Fort Smith, Ark., in supplying water for their plant. This plant produces many tons of slab zinc each month. For raw material it uses the zinc sulphide ore which originates in the district located in northeastern Oklahoma, southwestern Missouri, and southeastern Kansas. These ores, roasted to remove the oxygen, produce a high grade of slab zinc. This process and the machinery in the plant consume from 1,000,000 to 1,500,000 gallons of water per month. This supply of water was formerly purchased at a flat rate per month.

A SMALL, track-type, spring-return limit switch, intended for use in making or breaking control or indicating circuits at a fixed point in the travel of a part of a machine or mechanism, has been introduced by the General Electric Company. The switch, designated as CR9440-A1A, has one normally open and one normally closed circuit. Its maximum carrying and breaking capacity is 5 amperes at 550 volts a. c., and on d. c. ranges upward from 0.4 amperes at 550 volts to 2.0 amperes at 115 volts.

C. PARKER HOLT was named executive vice president of the Caterpillar Tractor Co. at a meeting of the board of directors held on Friday, December 7. Mr. Thomas J. Conner was made vice president in charge of manufacturing and was elected a director of the company to fill the vacancy of the board of directors caused by the recent death of Mr. Pliny E. Holt.

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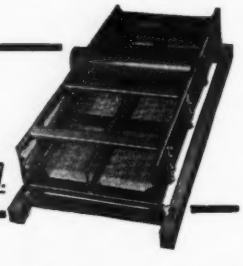

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In some period, moneys appropriated by Government for mining were one-fiftieth those used for agriculture—$10,000,000 against $500,000,000.

More than 25,000,000 Americans, directly or indirectly, depend upon the extraction or processing of mineral products for their livelihood. Coal mining, alone, provides employment to more men than any single manufacturing industry.

Book value of capital investment in the mineral industries estimated between $12,000,000,000 and $15,000,000,000.

Average annual value of America's mineral products is approximately $4,500,000,000.

Products of mines, including crude oil, formed 55.9 per cent of the tonnage of revenue freight handled by Class 1 railroads over five-year period.

The average annual production of coal in the United States would fill a bin 160 acres square and 4 feet high.

Mineral substances are produced in two of every three counties in the United States—every state of the Union is a factor in the mining industry.

Annual production of copper, rolled into ½-inch electric transmission wire, would extend 133,000 miles—five and one-half times the earth's circumference.

U. S. production of cement, lime, gypsum, slate, stone, sand, gravel, used in building and highway construction, was 234,000,000 tons, equal to 4,680,000 carloads.

Government has a direct part to play in maintenance of mine safety—this entire program jeopardized by curtailment of Bureau of Mines activities.

Realm of mineral production and processing is the abiding place of complexities. Problems encountered in that field tax almost boundless patience of science—Bureau of Mines has functioned for almost a quarter of a century as a purveyor of technical information that has increased efficiency and productiveness of mineral activity and maintenance of its program.

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